



# CHEMICAL ABSTRACTS

Vol. 16.

August 20, 1922

No. 16

## 1—APPARATUS

C. G. DERICK

**A study of the balance.** A. E. CONRADY. *Proc. Roy. Soc. (London)* 101A, 211-24 (1922).—C. made a large number of weighings on an inexpensive Sartorius balance and by a thorough study of the sources of errors has reduced the probable error of a weighing to 0.0003 mg. The study of the effect of the different parts of the balance on the errors leads to the conclusion that a precision balance should have a short beam with few joints or screws, and with knife edges cemented in place. An adjustment for parallelism of knife edges is necessary, together with a means of removing the effect of tilting of planes on which knife edges rest. C. supplements the arrestment with a "brake" of light wire, bearing on the pointer, which permits the balance always to start from its actual point of rest. The balance case should be draught-proof and uniform in temp. throughout. All-aluminium construction is suggested.

D. F. S.

**The construction and use of the Steele-Grant microbalance.** E. J. HARTUNG. *Phil. Mag.* 43, 1056-64 (1922).—A critical discussion of the proposals of various authorities regarding the construction and use of the well known quartz microbalance first proposed by Steele and Grant, together with certain recommendations gathered from the experience of the author in using the balance in measuring the loss of wt. of AgCl under the effect of light. The beam, the knife-edge, and the fiber suspension are dealt with successively.

S. C. L.

**Pressure bottle for laboratory use.** A. D. HIRSHFELDER AND M. C. HART. *J. Ind. Eng. Chem.* 14, 623 (1922).—An easily made and cheap pressure bottle is described. It can be used at temps. above 150° and pressures above 6 atm. It is provided with a simple safety valve.

D. E. S.

**A new flask for the quantitative regulation of a continuous gas stream.** RAYMUND SCHLEIPEN. *Chem.-Ztg.* 46, 406 (1922).—Cuts and a brief description of the app., which consists of 2 bottles connected at the bottom, the tops being connected by elongated, curved necks which enter the body of a common cock through slip-joints. A quarter turn of the cock allows either bottle to be filled with the gas while the other empties at the same rate, which is indicated on a scale between the bottles.

J. H. MOORE

**New apparatus for investigating paraffins, waxes, resins, pitches and asphalts.** ANON. *Chem.-Ztg.* 46, 386 (1922).—The app., Nashan's "*Malakograph*," is for the detn. of the rate of softening of waxes, etc. It consists of a balance to 1 arm of which a chain attaches a ball; the ball rests in a dish which may be heated by an elec. plate or in a bath. A wt., heavier than the ball, is hung from the other arm by a cord which actuates a pen moving over a revolving chart. To operate, the ball is placed in the center of the dish filled with the broken material which is melted and added to until it just covers the ball. After cooling thoroughly the dish is placed in a suitable bath (H<sub>2</sub>O for temp. below 100°), the balance chain attached to a hook in the top of the ball and the bath heated slowly. As the material softens the counter-wt. slowly falls and the pen describes a curve on the chart. Curves for a given substance are const. and characteristic.

J. H. MOORE

**Compressed-air filters.** SCHNECKENBERG. *Chem.-Ztg.* **46**, 406(1922).—Air pressure over the soln. is a more economical and convenient method of filtering in many cases than vacuum. J. H. MOORE

**Standardization of filter presses.** ANON. *Chem. Trade J.* **70**, 718-9; *Chem. Age*(London) **6**, 788-9(1922).—Report of a joint committee of the Assoc. Brit. Chem. Mfrs. and the Brit. Chem. Plant Mfrs. Assoc. E. H.

**Distilling head for laboratory apparatus, etc.** P. ANDERS and P. M. GINNINGS. U. S. 1,418,691, June 6.

**Apparatus for dehydrating solid substances.** F. MAUS. U. S. 1,418,386, June 6.  
**Electrical resistances of molybdenite.** W. W. COBLENTZ. U. S. 1,418,362, June 6.  
**Molybdenite resistors are adapted for photosensitive app.**

**Apparatus for treating water, oil or other liquids with ozone.** D. G. MACGREGOR, G. B. MILLEN and J. C. W. STANLEY. U. S. 1,420,046, June 20. A shower of the liquid is allowed to pass in contact with a current of ozonized air.

**Acetylene generator.** C. J. and G. J. CLEPTON. U. S. 1,417,974, May 30. Carbide is fed to a receptacle contg.  $H_2O$ , which is provided with a device for removing sludge.

**Porous charge for acetylene storage tanks.** E. KLEBERT. U. S. 1,419,862, June 13. A mixt. of crushed charcoal and cork.

**Tank for storage of acetylene.** F. J. MEYZGAR. U. S. 1,419,746, June 13. The tank is filled with balsam or other light porous wood chips and a solvent for  $C_2H_2$ , e. g., acetone.

**Detecting gases in trenches or other spaces.** E. P. S. NEWMAN. U. S. 1,419,685, June 13. Gases are detected by movement of a diaphragm one side of which is exposed to the atm. to be tested and the other side of which is exposed to atm. from a higher elevation where the air is relatively free from the gas to be detected.

**Apparatus for desiccating liquids.** H. B. FABER and W. H. HARDING, JR. U. S. 1,419,664, June 13. The liquid to be desiccated is nebulized into a tower through which heated air is circulated.

**Portable apparatus for generating poisonous gases.** J. W. VAN METER. U. S. 1,419,653, June 13. The app. is adapted for generating "chlorocyanic" gas for fumigation.

**Drying apparatus.** TEIZABURŌ KATAOKA. *Jap.* 39,456, Aug. 3, 1921. Frames having many shelves contg. materials are introduced into a heated chamber.

**Apparatus for reactions at high temperatures under pressure.** A. T. STUART and G. N. MIDDLETON. U. S. 1,417,585, May 30. The app. is adapted for *cracking hydrocarbons*. It comprizes a closed reaction chamber the wall of which is of a material having a high elec. resistance by which it may be heated by elec. current to the desired reaction temp. The reaction chamber is surrounded by reinforcing material to support its wall against internal pressure.

## 2—GENERAL AND PHYSICAL CHEMISTRY

W. E. HENDERSON AND EDWARD MACK

**The density of air in Madrid and the Loomis-Morley hypothesis.** E. MOLES, T. BATUECAS and M. PAYÁ. *Anales soc. españ. fis. quim.* **20**, 34-40(1922).—Frequent detns. were made throughout a year. The samples were freed from dust,  $H_2O$ , and  $CO_2$  before weighing. The av. wt. of 1 l. at  $0^\circ$  and 760 mm. was 1.29308 g. The max. variation was 0.0008 g. The variations found agreed with the Loomis-Morley hypothesis. L. E. GILSON

**The birth of chemistry.** M. STÉPHANIDÈS. *Scientia* 31, 189-96(1922).—Alchemy in ancient Egypt and in Greece is discussed. E. H.

**Ernest Solvay.** W. J. POPP. *J. Soc. Chem. Ind.* 41, 231-2R(1922). PAUL KRSTNER. *Chem. Met. Eng.* 26, 1202(1922).—Obituary. E. H.

**Pycnometer density determinations.** R. SAAR. *Chem.-Ztg.* 46, 433-5(1922).—A series of tables, calcd. to 6 decimal places, for correcting to standard conditions densities detd. under a given set of conditions. Illustrated by problems.

W. C. EBAUGH

**Notes on the kinetic theory of gases.** Sutherland's constant  $S$  and van der Waals'  $a$  and their relations to the intermolecular field. R. H. FOWLER. *Phil. Mag.* 43, 785-800(1922).—A mathematical treatment in 2 parts. In the first the conditions are considered under which a strict comparison may be made between the mol. field deduced from Sutherland's const.  $S$  and from van der Waals'  $a$ . Comparison shows a serious discrepancy between the values deduced in the 2 ways, which has not yet been resolved in detail. In the 2nd part, 2 simple proofs are given of the exact formula for van der Waals'  $a$  as a function of the intermol. field of force. The calcs. are reduced to explicit formulas for 2 particular mol. models: (1) elastic spheres attracting according to an inverse 5th power law; (2) elastic spheres surrounded by a limited spherical shell in which there is a const. attraction, with no forces at-all outside. S. C. L.

**Determinations of the charge on droplets at pressures of one to nine atmospheres.** K. WOLTER. *Z. Physik* 6, 339-51(1921).—In order to obtain reliable results in detg. the value of  $e$  by the Millikan-Ehrenhaft method, the ratio of the mean free path of the mols. of the medium to the radius of the particles must be less than 0.4. The low results in the value of  $e$  in certain cases may therefore be attributed to the size of the particles. The limiting value of the radius of the particle for a pressure of 1 atm. is about  $25 \times 10^{-6}$  cm. Particles of smaller size could be used at higher pressures where the mean free path of the mols. would be shorter. The theory is tested with particles of Cu, S, Hg, and Pt. The error is found to persist at the higher pressures. It is concluded that the size of the particles is not the principal source of error but that the particles have a lower  $d$ . than the ordinary  $d$ . of the solid or liquid in large masses. This decrease in  $d$ . is due to the influence of a gas layer at the surface of the particle which has a noticeable effect only on the smaller particles. This explanation seems more probable in view of the fact that Cu gives uniformly low results for the value of  $e$  on account of decreased  $d$ . due to the admixt. of the oxide. The value of  $e$  obtained is  $4.8 \times 10^{-10}$  e.s.u., checking results obtained by Millikan, Regener, Radcl and others. C. R. PARK

**The ultramicroscopic image of colloidal carbon.** H. LACHS. *J. phys. radium* 3, 125-7(1922).—The ultramicroscopic image of the colloidal C investigated contains a considerable number of very brilliant stationary particles and a smaller number of fine particles that show a slight Brownian movement. Scattered through the entire field are also some very brilliant particles that show pronounced scintillations. This is due to the shape of the particles. If they are rods or plates the amt. of light dispersed varies with the orientation of the particle, thus causing sparkling. This phenomenon may be considered as a case of *ultramicroscopic anisotropy*. HARRY B. WEISER

**Coagulation of colloidal arsenious sulfide.** Influence of concentration of colloid, of agitation, and of temperature. A. BOUTARIC and M. VUILLAUME. *Compt. rend.* 174, 1351-3(1922); cf. *C. A.* 15, 3778.—By the method of procedure previously described, it was found that on coagulating  $As_2S_3$  sols. contg., resp., 6.2, 3.1, and 1.55 g.  $As_2S_3$  per l. with 0.14 N KCl and with 0.00017 N  $AlCl_3$ , the velocity of coagulation with KCl increased greatly with concn. of the sol, while with  $AlCl_3$  the velocity decreased rapidly as the concn. of the sol increased. The rate of increase in the opacity of the sol in not altered when the sol is stirred continuously with a rod. In this case coagulation with



KCl sets in only after the max. opacity has been attained, but with  $\text{BaCl}_2$  and  $\text{AlCl}_3$  the sol coagulates before reaching its max. opacity. The velocity of coagulation with KCl, NaCl,  $\text{NH}_4\text{Cl}$ , and  $\text{LiCl}$  is less the higher the temp., while with  $\text{BaCl}_2$ ,  $\text{CaCl}_2$ ,  $\text{SrCl}_2$ ,  $\text{MgCl}_2$  and  $\text{CdCl}_2$  it is greater the higher the temp. With  $\text{AlCl}_3$  the velocity of coagulation is not greatly affected by the temp.

F. L. BROWNE

**Pure aniline and water emulsions.** S. S. BHATNAGAR. *J. Phys. Chem.* 25, 735-41 (1922).—Emulsions of aniline were prepd., sepd., and the amt. of aniline present was estd. colorimetrically. The procedure adopted in detg. the ratio of coagulation was to note the time required to produce a perceptible change corresponding to a definite degree of turbidity when a definite amt. of electrolyte was added. Many electrolytes were tested and the effects in general are the same as in the case of most sols. The trivalent electrolytes are more effective than the bivalent ones and the bivalent more effective than the univalent ones. The order of the coagulating efficiency of the electrolytes is  $\text{Al} > \text{Cr} > \text{Ba} > \text{Sr} > \text{K} > \text{Na}$ . The effect of diln. on the rate of coagulation showed that the diln. makes the suspensoids more stable as far as the effect of electrolytes is concerned.

E. F. PERKINS

**Influence of protective colloids on the corrosion of metals and on the velocity of chemical and physical change.** J. A. N. FRIEND AND R. H. VALLANCE. *J. Chem. Soc.* 121, 466-74 (1922).—Expts. were carried out on corrosion of Fe, Zn, and Pb in aq. soln. and 0.2% protective colloidal concn. with 8 different colloids. In each case corrosion was less than in water. The same expt. was repeated with Fe, Zn, and Pb in a 3% NaCl soln. and 0.1% colloid concn. In each case corrosion was less than in the NaCl soln. alone. It is probable that this phenomenon is due to adsorption. Calcs. based on the adsorption law also check the exptl. data in most cases. The rate of soln. of  $\text{K}_2\text{SO}_4$  and  $\text{KClO}_4$  in water in the presence of a protective colloid was also found to be less in the presence of this colloid than in the water alone. That the results do not obey the adsorption law in this case is undoubtedly due to the "salting out" of the protective colloid. The retarding effect exerted by protective colloids was found to be almost negligible in such systems as involve no change in state, which would be expected if the phenomenon is one of adsorption. Exptl. confirmation of this showed that a 1.25% colloidal agar soln. had no influence on the velocity of the acid catalysis of methyl acetate.

E. F. PERKINS

**Studies in protective colloids. Twelfth series: Gelatin as a protective colloid. I. Colloidal silver.** A. GUTBIER, J. HUBER AND A. ZWEIFLE. *Kolloid-Z.* 30, 306-13 (1922).—Three kinds of gelatin were used to det. the proper concn. of protective colloid and to study the color changes and other properties of colloidal Ag thus protected by gelatin. Two of these were the best grades of fodb gelatin and the other was pure photographic emulsion gelatin. The stability of the gelatin sols. was greatly increased by the addn. of  $\text{CHCl}_3$ , toluene, tertiary trichlorobutyl alc. and Et acetate (cf. C. A. 11, 1348). Varying quantities of  $\text{AgNO}_3$  soln. (1 : 1000) were added to a 2% or a 0.1% gelatin soln. and reduced by freshly prepd. sols. of  $\text{N}_2\text{H}_4$ ,  $\text{H}_2\text{O}$  (1 : 2000) or  $\text{Na}_2\text{S}_2\text{O}_4$  (1 : 100). When reduced with  $\text{N}_2\text{H}_4$ ,  $\text{H}_2\text{O}$ , the colors obtained were shades of wine-red, brown, green and yellow, but at most concns. of Ag brown and green colors predominated. When the colloid prepd. by mixing equal parts of the 0.1% gelatin and the  $\text{AgNO}_3$  solns. was dialyzed and dried in a vacuum at ordinary temp. over  $\text{H}_2\text{SO}_4$ , it was found to contain 20.8% Ag. In a similar way 30 parts of a 0.42% gelatin with 10 parts of a 0.1 N  $\text{AgNO}_3$  soln. gave 40.45% Ag. A smaller proportion of gelatin did not increase the Ag content. Other concns. of gelatin and  $\text{AgNO}_3$  gave values between 20.8 and 40.45%. These Ag colloids were reversible. When the  $\text{AgNO}_3$  was reduced by  $\text{Na}_2\text{S}_2\text{O}_4$ , the Ag colloid was not so stable and had a smaller Ag content. In order to study the influence of electrolytes, sols. of different normality of HCl,  $\text{H}_2\text{SO}_4$ , NaOH,  $\text{Na}_2\text{CO}_3$ ,

$\text{Na}_2\text{S}_2\text{O}_4$ ,  $\text{NaCl}$ ,  $\text{BaCl}_2$  and  $\text{MgCl}_2$  were added to equal quantities of the dialyzed colloid and allowed to stand at room temp. All chlorides quickly and quantitatively destroyed the colloid.  $\text{H}_2\text{SO}_4$  and  $\text{Na}_2\text{S}_2\text{O}_4$  caused slow sedimentation while  $\text{NaOH}$  and  $\text{Na}_2\text{CO}_3$  were without coagulating action.

H. M. McLAUGHLIN

**A general theory of adsorption from solution.** WO. OSTWALD and R. DE IZAGUIRRE. *Kolloid Z.* 30, 279-306(1922).—The simplest expression showing the relation between adsorption and the concn. of soln. is Boedecker's exponential formula:  $x = ke^c$ . The equation is of limited applicability and a number of modifications of it have been proposed. The authors point out that correction must be made for adsorption of the solvent and for the change in concn. during adsorption. It is assumed that the adsorption of a dissolved substance increases asymptotically at the highest concns. in accord with Boedecker's equation, but that this regularity does not obtain at lower concns. Although the amt. adsorbed increases with increasing concn. at low concns., the difference in concn. before and after adsorption must show a max. if the adsorption of solute is disregarded and will approach 0 only at high concns. Equations are given showing the relation between adsorption and concn. which take into account the change in concn. of solute during adsorption (1) when disregarding the adsorption of solvent and (2) when considering the adsorption of the solvent either as a direct process or by solvation of the adsorbed solute. Graphic methods are given for detg. the consts. of the equations, which are then applied to the adsorption by charcoal of  $\text{HOAc}$  from  $\text{H}_2\text{O}$  and of phenol from  $\text{EtOH}$ . Attention is called to the application of these equations to the relation between adsorption and concn., the biol. action of neutral salts and the cause of anomalies in the partition of a dissolved solute between 2 solvents.

HARRY B. WEISER

**Adsorption: its significance in catalytic processes.** A. PICKLES. *Chem. Age* (London) 6, 586-7(1922).—Adsorption is a surface phenomenon. It is sufficiently energetic to decompose mols.  $\text{H}$  in an elec. light bulb is atomized.  $\text{H}$  passing through porous clay or charcoal will reduce  $\text{FeCl}_3$  at ordinary temp. The radioactivity of radio- $\text{Th}$  sol is 4.8 times as great as of  $\text{Th}$ . If the atom is to be disrupted it may be by the help of adsorption. These enormous strains, set up by adsorption on the surface of a catalyst, furnish the energy to hasten or retard chem. action. The spectra of catalytic elements indicate that the atoms are complex. The different catalysts may modify the forces of the substances whose reactions are catalyzed in different ways and thus give different products.

F. E. BROWN

**The surface tension of colloidal solutions.** HEDWIG SCHLEIFFER. *Kolloid Z.* 30, 273-8(1922).—The surface tension at different temps. was detd. for a number of colloidal solns. in  $\text{H}_2\text{O}$ . Azobenzene, myristic acid, mastic and gum arabic were found to lower the surface tension of the dispersion medium but gamboge and hydrous  $\text{Al}_2\text{O}_3$  did not affect it. The temp. coeff. of the colloids was almost identical with that of  $\text{H}_2\text{O}$ . Investigation showed that neither the viscosity nor the vapor tension of  $\text{H}_2\text{O}$  was changed by the presence of the suspended particles, indicating that little or no soln. took place.

HARRY B. WEISER

**The determination of surface tension from the maximum pressure in bubbles.** S. SUGDEN. *J. Chem. Soc.* 121, 858-66(1922).—This method, sometimes known as Jaeger's method has been used as a comparative method for detg. surface tension. The mathematical theory of a small circular surface with a cylinder in the middle is difficult. This difficulty can be avoided by using tubes of different diams. and calcg. the surface tension from the difference in pressure in the 2 tubes. The larger tube must be several mm. in diam. and the equation usually used is valid only when the radius divided by the pressure is small. This paper extends the theory to include tubes as large as 11 mm. in diam. The surface tension of water at  $20^\circ$ , as detd. by this method, is 72.91; of benzene is 28.86.

F. E. BROWN

The crystal forms of the substituted aliphatic ammonium bromo-selenates and -tellurates, and their relations to the corresponding platinites. P. MAIER. *Z. Krist.* 56, 241-87(1921).—The compds. were made by dissolving  $\text{SeO}_3$  or  $\text{TeO}_2$  in  $\text{HBr}$  of sp. gr. 1.38 and adding the calcd. amt. of alkyl bromide, the ppt. being then dissolved in dil.  $\text{HBr}$ .  $(\text{NH}_4)_2\text{SeBr}_6$  is cubic;  $(\text{NH}_2\text{CH}_3)_2\text{SeBr}_6$  pseudo-rhombohedral, as is also the corresponding Sn salt.  $(\text{NH}_2\text{C}_2\text{H}_5)_2\text{SeBr}_6$  is ditrigonal-scalenohedral while the Sn salt is apparently hexagonal.  $(\text{NH}_2n\text{-C}_4\text{H}_9)_2\text{SeBr}_6$  is pseudomonoclinic, the Sn and Te salts monoclinic prismatic;  $(\text{NH}_2\text{iso-C}_4\text{H}_9)_2\text{PtBr}_6$  is rhombic.  $(\text{NH}_2n\text{-C}_6\text{H}_{13})_2\text{SeBr}_6$  is monoclinic prismatic, while the Sn and Te salts are of the same class, but approximate the hexagonal system.  $(\text{NH}_2\text{iso-C}_6\text{H}_{13})_2\text{SeBr}_6$  and the Te salt are both ditrigonal-scalenohedral, while the Sn salt is rhombic.  $(\text{NH}_2\text{Me}_2)_2\text{SeBr}_6$  and the Sn and Te salts and rhombic, the first 2 approximating to tetragonal.  $(\text{NH}_2\text{MeEt})_2\text{PtBr}_6$  is rhombic, as is also  $(\text{NH}_2\text{MeEt})_2\text{SnCl}_6$ ,  $(\text{NH}_2\text{Et}_2)_2\text{SeBr}_6$ , the corresponding Sn salt, and the Te-Cl one are monoclinic prismatic.  $(\text{NH}_2(\text{C}_2\text{H}_5)_2)_2\text{SeBr}_6$  and the Sn and Te salts are all monoclinic, but the Sn one has also a rhombic form.  $(\text{NHMe}_2)_2\text{SeBr}_6$  has both a rhombic and a cubic form, while the Sn salt is only known cubic, but shows, on simultaneous crystallization, isomorphism.  $(\text{NHMe}_2\text{Et})_2\text{SeBr}_6$  has monoclinic, rhombic, and cubic forms.  $(\text{NHEt}_2)_2\text{SeBr}_6$  and the Sn and Te salts are monoclinic prismatic, although the last has also a cubic form.  $(\text{NH}(\text{C}_2\text{H}_5)_2)_2\text{SeBr}_6$  is monoclinic, the Sn salt monoclinic with a dimorphous trigonal form, and the Te one monoclinic and rhombic. The polymorphism, morphology, and isomorphism shown in this series of salts are striking, and topic axis data for a few of them are given to show the effect of substitution of one radical for another.

E. T. WHERRY

Cinnamic acid in cryoscopy. P. FALCIOLA. *Gazz. chim. ital.* 52, I, 175-9(1922).—Mathews (*C. A.* 11, 2061) detd. the f. p. const. for cinnamic acid (A) but did not obtain practical or definitive results. F. describes his own expts. using anthracene,  $\text{C}_{10}\text{H}_8$ , *m*-, *p*- and *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{CHO}$ , phenylpropionic (B) and phenylpropionic acids. The f. p. const. deduced from these data for substances that presumably all act normally is about  $K = 100$ . The results with B are about normal. It does not seem to form solid solns. in A. Bruni and Gorni (*Gazz. chim. ital.* 37, I 52(1907)) found, however, that A in B gives solid solns. This tends to confirm the rule established by Mascarelli and Pestalozza (*C. A.* 2, 1826).

E. J. WITZEMANN

Conditions governing the formation and stability of ammonium carbamate. C. MATIGNON AND M. FRÉJACQUES. *Bull. soc. chim.* 31, 307-16(1922).—A continued study of the dissociation pressure and the heat of formation of ammonium carbamate (A). A was prepd. from  $\text{CO}_2$  and  $\text{NH}_3$  as before (cf. *C. A.* 15, 1499). The heat of formation calcd. from both the equil. formulas of Naumann (*Ann.* 160, 15(1871)) and Isambert (*Compt. rend.* 92, 919; 93, 731(1881)) had a mean value of 37.8 cal. at ordinary temp. The dissociation pressure was measured by a specially constructed app. consisting essentially of a temp.-controlled oil bath in which was immersed a sealed glass cylinder. The latter was provided with a Hg manometer connected at the bottom. A toluene thermo-regulator and stirrer completed the app. A was placed on top of the Hg in the glass cylinder. Formulas derived from the data of Naumann and Isambert (*loc. cit.*) and Fichter and Becker (*C. A.* 6, 750) were not in strict accordance with the new data obtained. The formula best in accord with the new exptl. data was  $\log p = -(4.821/T) - 15.4 \log T + 53.3586$ , where  $p$  = pressure in atm. and  $T$  = abs. temp.

C. C. DAVIS

The transformation of ammonium carbamate. C. MATIGNON AND M. FRÉJACQUES. *Bull. soc. chim.* 31, 394-412(1922); cf. preceding abstr.—A study of the transformation of  $\text{H}_2\text{NCOONH}_4$  (A) to  $\text{CO}(\text{NH}_2)_2$  (B). The following reactions are assumed to take place: (1)  $\text{A} \longrightarrow \text{B} + \text{H}_2\text{O}$ ; (2)  $\text{A} \longrightarrow \text{CO}_2 + 2\text{NH}_3$ ; (3)  $\text{A} + \text{H}_2\text{O} \longrightarrow (\text{NH}_4)_2\text{CO}_3$ ;

(4)  $(\text{NH}_4)_2\text{CO}_3 \longrightarrow \text{NH}_4\text{HCO}_3 + \text{NH}_3$  and (5)  $\text{NH}_4\text{HCO}_3 \longrightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{NH}_3$ . This system is proved to be bivalent. If the vol. of the system in equil. is increased, a reaction occurs tending to oppose this increase, i. e., the reaction effects a diminution of pressure. Accordingly there exists for each temp. a max. pressure of dissociation corresponding to the case where the vol. of the gaseous phase is negligible. Among all the possible systems in equil. at any temp., that system corresponding to the max. pressure is univariant. The following values give in atm. the tension of A, the approx. max. pressure and the sum of the pressures of A and  $\text{H}_2\text{O}$ , resp., at definite temps.:  $100^\circ$ , 6.04, 9.03, 7.04;  $122^\circ$ , 14.08, 20.95, 16.09;  $135^\circ$ , 24.02, 33.14, 27.03;  $150^\circ$ , 39.04, 55.10, 44.01. The greater value of the max. pressure compared to that of the sum of A and  $\text{H}_2\text{O}$  is due to the secondary reaction (2), (3), (4) and (5). The yield of B depends both on the temp. and on the vol. in which a given wt. of A is transformed. In all expts. the vol. of gas was kept as nearly negligible as possible, so that the only variable was the temp. The following values give, resp., the temp., the hrs. to reach equil. for the max. yield, and the mean % max. yield of B:  $130^\circ$ , 39, 39.2;  $134^\circ$ , 40, 39.2;  $140^\circ$ , 40, 41.3;  $145^\circ$ , 24, 43.3. At  $150^\circ$  equil. had not been attained in 4 hrs. A curve showing yield as a function of temp. gives a max. yield of 46% at  $150^\circ$ . Similar yields were obtained by heating B and  $\text{H}_2\text{O}$  under pressure. These values are strictly those of the concn. of B in the liquid phase, but the difference between these values and the theoretical totals can be disregarded. The heat of reaction (1) was found to be experimentally  $-7.7$  cal., compared with a theoretical value of  $-6.7$ . Cf. C. A. 16, 1395. C. C. DAVIS

**Equilibrium among a few organic compounds.** H. HAMMARSTEN. *Arkiv. Kemi, Mineral. Geol.* 8, No. 16, 14 pp. (1922).—A study of the equil. of  $\text{PhHNNH}_2$  (A) with  $\text{AcH}$  (B) and with  $\text{Me}_2\text{CO}$  (C), resp. Exact measurements were difficult because formation of  $\text{MeCH:NNHPh}$  (D) and  $\text{Me}_2\text{C:NNHPh}$  (E) was nearly complete and because D and E are difficultly sol. in  $\text{H}_2\text{O}$ . Two methods of detn. were used: (1) the soly. method of Euler and Svanberg (C. A. 15, 1539) and (2) a refraction method employing an interferometer. By (1), which is usually applicable to difficultly sol. compds., the soly. limits at varying relative concns. of the reacting compds. are detd. By means of the mass-action law the equilibrium can be calcd. with these values. (2) is accurate for very dil. solns. and is based on the principle that the refractive power, otherwise additive, increases enormously upon formation of the hydrazones. Owing to oxidation or to formation of hydrates of varying soly. no satisfactory results could be obtained with (1). If the values of  $n$  for  $N$  solns. of A, C and D are  $n_A$ ,  $n_C$  and  $n_D$ , resp., and if the concns. of A and C before reacting are  $aN$  and  $cN$ , resp., and at equil. the concn. of D is  $xN$ , then in the beginning  $n_0 = an_A + cn_C$  and at equil.  $n_x = (a-x)n_A + (c-x)n_C + xn_D$ . From this is derived  $x = (n_0 - n_x)/(n_D - n_A - n_C) = (n_0 - n_x)/\delta$  and according to the mass action law  $k = [(a-x)(c-x)]/x$ . Various concn. ratios  $C/A$  were investigated. Based on the interferometer scale, the following values of  $n$  were obtained:  $n_C$  12,100,  $n_B$  11,500,  $n_A$  90,200,  $n_E$  131,300,  $n_{AD}$  118,700,  $n_{BD}$  115,500,  $n_{ED}$  115,700. A great increase in  $n$  is thus shown to occur upon formation of the hydrazone. For solns. of A-C in equiv. concn., of E, of A-C with excess A, of A-C in equiv. concn. in varying  $\text{HCl}$  soln., of A-B in varying concns. and of D, the mean values of  $k$  were resp.:  $7 \times 10^{-4}$ ,  $9 \times 10^{-4}$ ,  $2 \times 10^{-3}$ , variation from  $7 \times 10^{-4}$  to  $800 \times 10^{-4}$ ,  $10^{-3}$  and  $2 \times 10^{-4}$ . The greater value of  $k$  for E than for A-C is due to slight but unavoidable oxidation. The values of B and C are so widely different that a double compd. is assumed to be formed. The different values of  $n$  for  $\alpha$ - and  $\beta$ -hydrazones could not be explained. Preliminary expts. with  $\text{AcH}$  and  $\text{NH}_2\text{OH}$  showed that there was no increase in  $n$  on formation of the addn. compd. From this it is inferred that the compd. formed is probably  $\text{MeCH.NH}$  and not  $\text{MeCH:NOH}$ . C. C. DAVIS

"Dynamic" allotropy of tellurium. A. DAMIENS. *Compt. rend.* 174, 1344-6 (1922); cf. Cohen and Kroner, *C. A.* 7, 2876.—Expts. in which Te prepd. in various ways is heated discredit the theory of "dynamic equilibrium." According to this theory various allotropic forms exist in the same sample of Te and all but one tend to disappear upon heating. The small variations observed in density upon heating may be explained by slight porosity.

C. R. PARK

Corresponding states: the halogenated derivatives of benzene. M. PRUD'HOMME. *Bull. soc. chim.* 31, 295-9 (1922); cf. *C. A.* 15, 783, 784, 2228.—The ratios  $T/T_c$ ,  $P/P_c$  and  $D/D_c$ , where  $T$  = abs. temp.,  $P$  = pressure in atm.,  $D$  = density and  $T_c$ ,  $P_c$  and  $D_c$  the crit. consts., are called the "reduced values" of a compd. When  $P = 1$ ,  $P_c$  must be a const. and this  $P_c$  value is used below instead of  $P/P_c$ . Only 1 family of compds. has been discovered for which all 3 sets of values are the same for each member, viz. PhF, PhCl, PhBr and PhI. If  $T_1$  = abs. b. p.,  $T_1'$  = abs. m. p.,  $D_0$  = d. at abs. 0°,  $n_0$  =  $n$  at abs. 0° and  $n_c$  =  $n$  at crit. temp., the values  $T_1/T_c = 0.640$ ,  $P_c = 44.63$ ,  $D/D_c = 3.87$  and  $n_0/n_c = 1.38$  are const. for all 4 compds. In the previously known formula  $M = A(T_c/P_c)D_c$ ,  $A = 21.65$  for these halides, from which is derived  $D_c = 2.06(M/T_c)$ . From the latter, the values of  $M$  were found to be F 96, Cl 112.5, Br 157, I 204. The values of  $D_c$  as observed and as calcd. were, resp.: F 0.354, 0.353; Cl 0.365, 0.366; Br 0.484, 0.483; I 0.581, 0.582. The properties of F, Cl, Br and I are thus completely masked in the phenyl halides insofar as their detection by their reduced values of  $T$ ,  $P$  and  $D$  are concerned. If the relation  $M = A(T_c/P_c)D_c$  is represented geometrically as a rectangular parallelepiped with sides  $A/P_c$ ,  $T_c$  and  $D_c$ , the vol. represents the mol. wt. This vol. is considered as a 4th element in the identification of a compd.

C. C. DAVIS

Calculation of vapor pressures of naphthalene, anthracene, phenanthrene, and anthraquinone by Dühring's relation. B. F. DODGE. *J. Ind. Eng. Chem.* 14, 569-70 (1922).—The vapor pressures at any temp. of a great variety of substances may be calcd. with reasonable accuracy, provided only that 2 points on the vapor pressure curve are known, by use of the simple relationship discovered by Dühring.

J. T. R. A.

The molal entropy of vaporization as a means of determination of heats of vaporization. W. K. LEWIS AND H. C. WEBER. *J. Ind. Eng. Chem.* 14, 485-6 (1922).—"A variation in Hildebrand's method of plotting molal entropy of vaporization is presented which is considered more useful than the original method. A wide range of data is presented to prove the value of the method, and means of detg. heats of vaporization are pointed out."

E. G. R. ARDAGH

Determination of heats of vaporization from vapor pressure data. W. K. LEWIS AND H. C. WEBER. *J. Ind. Eng. Chem.* 14, 486-7 (1922); cf. preceding abstr.—"A method of estg. the vapor pressure of a liquid at any temp., one point on whose vapor pressure curve is known, is presented, and a method of getting heats of vaporization from vapor pressure data by a consideration of the Clausius eqn. is pointed out."

E. G. R. ARDAGH

The heat of combustion of lactic acid. O. MEYERHOF. *Biochem. Z.* 129, 594 (1922).—The heat of combustion of 1 g. H<sub>2</sub>O-free Zn lactate was found to be 2597 cal. Data are also given for the heats of diln. of lactic acid in various concns. The neutralization of ZnO with lactic acid produces 285 cal. per 1 g. ZnO. From these data the heat of soln. of Zn lactate (which is about 27.4 to 28.6 cal. per g.) and the heat of formation of ZnO the heat of combustion of lactic acid is found to be 3615 cal. per g.

F. S. HAMMETT

Periodical phenomena in the temperature functions of certain properties of the metals. G. BORELIUS. *Nature* 109, 613 (1922).—Measurements have been made of the thermoelec. force at ordinary temp. of specimens of Fe and W that had been suc-

cessively heated at different temps. and each time rapidly cooled. The thermoelec. force taken as a function of the heating temp. shows periodical changes and certain repeated intervals of transformation could be easily distinguished. The approximate abs. temp.  $T_n$  of transformation satisfies the relation  $T_n = An$ , where  $A$  is a const. and  $n$  an integer number. This relation has been verified experimentally for Fe from  $n = 3$  to 12, and for W from  $n = 4$  to 9. The mean value found for  $A$  was for pure Fe 97°, and for W 82°. This phenomenon is most probably due to the quantum distribution of vibration energy. As the mean number of quanta of the atoms increases continually with the temp. it is assumed, to explain the periodicities, that the transformations occur at every temp. for which a certain fractional part (1/ $r$ ) of the atoms has a number of quanta like or greater than a new integer. This assumption gives  $A = \theta/3 \log r$ , where  $\theta (= \theta_r)$  is the characteristic temp. of the metal under consideration. From this relation it has been calcd. that for Fe,  $r = 4.6$ , and for W,  $r = 3.3$ .

W. H. ROSS

**Fundamental questions concerning the kinetic theory of heat.** S. BOGUSLAVSKI. *Physik. Z.* 23, 209-19 (1922).—One of the basic questions which a kinetic theory of heat must answer is that of the mech. meaning of the thermal conceptions, as temp., entropy, and thermodynamic potential, and as yet no satisfactory answer has been given. The most important results have previously been attained by the Boltzmann theory of probability, but the notion of probability is not a mech. notion. B. demonstrates mathematically that the thermodynamic principles can be derived from the Hamiltonian principle of least action, based upon purely mech. conceptions. F. N. B.

**Contribution to the Born-Brody theory of the specific heat of solids at high temperatures.** A. MAGNUS. *Z. Physik* 7, 141-3 (1921).—The theory yields the conclusion that if the sp. heat,  $C_v$ , at high temp. exceeds  $3R$ , that is, 9.956 cal., it lies on a straight line passing through  $3R$  at 0° K. This conclusion has been tested by Magnus' results on Pt (C. A. 10, 1954). M. now recalcs.  $C_p$  from  $C_v$  and gets better agreement—better, as it happens, than corresponds to the precision of the data. W. P. W.

**Comment on the T<sup>3</sup>-law for the specific heats of solids.** CLEMENS SCHAEFER. *Z. Physik* 7, 287-96 (1922).—Debye's law, based on the quantum theory, that the sp. heats of solids at very low temps. are proportional to  $T^3$  is inadmissible at extremely low temps. It makes the sp. heat approach zero according to a cubic law. But Debye's formula is obtained by summing exponential expressions, hence the approach must ultimately be according to an exponential law. Debye overlooked the fact that there is a lower limit to the possible frequencies, so that his procedure in integrating the frequencies from zero is erroneous, though this is of practical importance only at extremely low temps. At such temps. the laws of thermodynamics do not apply. The interval in question, however, ordinarily extends only about 0.002° from the abs. zero, even for C, and hence is not a practical matter. With extraordinarily finely divided C, however, (2000 atoms only in a lump), this interval might reach 100° K. Planck has presented similar considerations. W. P. WHITE

**Comparison of the temperature scale of the P.T.R. with the thermodynamic scale between 0° and 100°.** F. HENNING AND W. HEUSE. *Z. Physik* 6, 215-23 (1921).—The P.T.R. standard, Pt thermometers, was compared with a He thermometer. The indication was that the Pt thermometers read about 0.005° low at 20° and 80° and the same amt. high at 50°, but the disagreements, with 9 or more expts. at each temp., sometimes reached 0.01°, so the result cannot be considered certain. W. P. W.

**Radii of the alkali atoms and their ions.** R. LORENZ. *Z. Physik* 6, 271-5 (1921).—A critical collection and tabulation of values of the radii of the alkali atoms and their ions, from various sources. C. R. PARK

**Cation volumes in permutite.** R. LORENZ. *Z. Physik* 6, 269-70 (1921); cf.

Günther-Schulze C. A. 15, 3919.—The alkali ion vols. calcd. by Günther-Schulze are probably too large and represent the space required rather than that actually filled. The values are larger than those obtained by several other investigators.

C. R. PARK

Determination of the diameter of electrolytic ions by the measurement of electric capacity. A. GÜNTHER-SCHULZE. *Z. Physik* 6, 229-38(1921).—The double elec. layer at the surface of a polished Ta plate immersed in an electrolyte consists of a single layer of atoms. By measuring the capacity of the condenser so formed the diam. of the atoms may be calcd. Detailed information as to the methods and results are not given.

C. R. PARK

Theory of the dielectric constant of diatomic dipolar gases. W. PAULI, JR. *Z. Physik* 6, 319-27(1921).—The classical equation of Debye relating to the dielec. const. and the elec. moment of a dipolar mol. differs from the equation developed from the quantum theory by a const. quantity. The relation between the elec. moments for diatomic mols. calcd. from the 2 equation is  $U_k = 2.1471 U_q$ , where  $U_k$  is that calcd. from the classical equation and  $U_q$  is that calcd. from the quantum theory. If values of  $U$  calcd. from the dielec. const. by means of the classical equation are higher than the directly measured values the equation will be proved worthless. All necessary data are obtainable for the hydrogen halides with the exception of the dielec. const. These should be measured.

C. R. P.

Temperature coefficient of the dielectric constant and double refraction. P. LARSS. *Z. Physik* 6, 257-68(1921).—Criticism of the work and conclusions of C. Bergholm (C. A. 15, 2783).

C. R. PARK

Dielectric constant of mica. J. R. WEEKS, JR. *Phys. Rev.* 19, 319-22(1922).—The variations in reported values of the dielec. const. of mica are probably due to air films between the laminae. Among 18 samples tested the av. value for those without visible air spaces was 8.1. The max. value was 9.3. The dielec. const. does not depend upon the source or grade of the mica.

C. R. PARK

Variations in the conductance of solid electrolytes. P. VAILLANT. *J. phys. radium* 3, 87-100(1922); cf. C. A. 15, 978.—When a solid electrolyte such as CaS is placed between metal electrodes and a voltage applied, polarization takes place and finally after some hours reaches an equil. value. If the temp. is suddenly changed the cond. undergoes 2 changes, one almost instantaneous, the other slow. The first effect is an exponential function of the abs. temp. The second effect is manifested in a series of oscillations of which the final effect is an increase or decrease in cond. depending upon whether the temp. has been lowered or raised. The increase or decrease is more rapid as the temp. change is greater.

C. R. PARK

The electro- and magneto-optical effects of liquids containing metallic powders in suspension. ST. PROCOPIU. *Compt. rend.* 174, 1170-72(1922).—In studying the elec. birefringence of toluene which had been standing over Na a negative birefringence was noted, while that of pure toluene is positive. Filtration caused this phenomenon to disappear. Hg, and finely powd. Mg, Al, Sb, Cu, Zn, Fe, Ni, Cd, and Bi were shaken with benzene, gasoline, benzyl alc., etc., and the resulting metallic suspensions examd. both in a Kerr app. having 2 vertical electrodes and also between the poles of an electro-magnet. All of these suspensions presented negative birefringences under either condition. When examd. in the darkness in an elec. field they were observed to become luminous as soon as the field was applied. These phenomena are probably due to orientation of the metallic particles following lines of force. As for the negative birefringence, it may be explained by reflection or refraction of light upon the threads of particles.

J. T. R. ANDREWS

Piezo-electric activity of Rochelle salt under various conditions. J. VALASEK.

*Phys. Rev.* **19**, 478–91(1922).—The elec. cond. is less than  $5 \times 10^{-8}$  up to  $45^\circ$  and then increases rapidly to  $5 \times 10^{-4}$  at  $57^\circ$ . The dielec. const. increases from 50 at  $-70^\circ$  to 1000 at  $0^\circ$ . The piezoelec. activity increases in a similar manner. Fatigue and hysteresis effects are similar to those noted for the magnetic properties of Fe.

F. O. A.

**The inversion of rotatory power in anisotropic liquids.** L. ROVER. *Compt. rend.* **174**, 1182–85(1922).—Certain anisotropic liquids are endowed with strong rotatory powers; among these may be mentioned some salts of cholesterol. In a mixt. of 5 parts of azoxyphenetole and 6 parts cholesteryl benzoate the rotatory power is to the left in the violet portion of the spectrum, though it is to the right in the red portion. For many substances this inversion occurs only in invisible portions of the spectrum, though it may be studied conveniently in the case of cholesteryl cinnamate, a substance which melts at  $156^\circ$  to an anisotropic liquid which at  $198^\circ$  passes over to isotropic. By undercooling one can observe the anisotropic phase as low as  $115^\circ$ . The anisotropic liquid reflects colors whose wave lengths are displaced toward the red as the temp. is lowered. The length of wave for which inversion is produced varies with the temp.; the length of wave of the reflected color varies in the same sense as the length of wave of inversion, and the two seem to be identical.

J. T. R. ANDREWS

**Notes on the preparation of some fluorescent and phosphorescent compounds.** W. S. ANDREWS. *Am. Mineral.* **7**, 19–23(1922).—Detailed directions are given for prep. in a condition such as to exhibit max. luminescence the compds.  $\text{Zn}_2\text{SiO}_4$ ,  $\text{Cd}_3(\text{PO}_4)_2$ ,  $(\text{Cd}, \text{Zn})_3(\text{PO}_4)_2$ , and  $\text{ZnS}$ , all contg. Mn as a necessary impurity; pure  $\text{Cd}(\text{OH})(\text{PO}_4)$ ,  $\text{CdSO}_4$  and  $\text{ZnSO}_4$ ; and a fluoride contg. some  $\text{NH}_4\text{F}$ .

E. T. WHERRY

**American research chemicals.** C. J. WEST. Nat. Research Council, *Reprint and Circ. Series No. 35*, 37 pp.(1922).

E. H.

**Behavior of platinum on strong heating.** D. BALAREFF. *Chem.-Zig.* **46**, 573 (1922).—Carefully cleaned Pt crucibles, both old and new, on heating with a blast lamp and with a Teclu burner lost wt. at the rate of about 0.0006 g. per hr. The cause was not detd. Certain observations made it seem probable that the loss bore some relation to the tendency of Pt at high temps. to occlude gases of the blast flame.

E. H.

**The L-series of lutecium and ytterbium and the identification of cerium with the element of atomic number seventy-two (DAUVILLIER) 3.**

### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

**Explanation of the property of induced polarity of atoms and an interpretation of the theory of partial valencies on an electronic basis.** WM. O. KERMAK AND ROBT. ROBINSON. *J. Chem. Soc.* **121**, 427–40(1922).—An attempt has been made to show that the Thomson and Lewis-Langmuir theory of valency and electron configuration furnishes a satisfactory phys. basis for certain modern hypotheses of org. chemistry. The following topics are treated: co-valence and electro-valence, polar character of atoms in combination, induced polarity in a chain of atoms, primary and secondary conjugation, aromatic nuclei, and mechanism of reactions. Since the clearness of the discussion depends on numerous diagrams and formulas, the original paper should be consulted.

H. JERMAIN CREIGHTON

**Electricity and matter.** ERNEST RUTHERFORD. *Engineering* **113**, 646–8(1922); cf. *C. A.* **15**, 2234.—An address on modern theories.

F. O. A.



The value of the Laue diagram. E. SCHIRBOLD. *Naturwissenschaften* 10, 399\* 411(1922).—Mathematical with a bibliography of 30 references. C. C. DAVIS

The atomic nucleus. R. BRUNETTI. *Nuovo cimento* 22, 215(1921).—A summary of recent work, by European investigators, on the atomic nucleus. A. W. CONTERI

The origin of solar heat. JEAN PERRIN. *Scientia* 30, 355-70(1921).—The subject is discussed historically under the following headings: antiquity of terrestrial life, problem of the origin of solar heat, energy of gravitation, meteoric theory, nebulae, isotopes, law of Prout, weighing of energy, condensation of light atoms to heavy atoms as the origin of solar heat, radioactivity, the stellar period. The theory of Kelvin and Helmholtz is considered inadequate to account for the flux of energy already dissipated. The theory deemed most adequate to account for solar heat is based on the condensation of light atoms to heavy ones. This theory has already been expounded in a more profound and a less popular manner (cf. *C. A.* 13, 3067). C. C. DAVIS

Formation and life of metastable helium. F. M. KANNENSTINE. *Astrophys. J.* 55, 345-53(1922).—By means of an oscillograph, current-potential curves were obtained for alternating and intermittent arcs in pure He at pressures of 0.06 to 2 mm. At frequencies of 200 cycles or less the striking potential was 29 volts, but for frequencies greater than 220 the current started at 5 volts, remained const. until 25 volts was reached, then increased. The breaking potential was always about 5 volts. In the intermittent arc the voltage was dropped from 36 to a lower value; if the latter was less than 4.8 the arc was suddenly extinguished; if between 4.6 and 23.7, the arc died out gradually; the arc was not extinguished by a drop to 25.3, or more, volts. This behavior suggests that He atoms, partially ionized at 20.8 v. and hence capable of complete ionization by further impacts of 4.8 v., remained in this metastable condition for an appreciable time, which is estd. to be of the order of 0.0024 sec. K. BURNS

Rutherford's  $X_3$  and the deviations from Coulomb's law in close proximity to the elemental charge. ADOLF SMEKAL. *Sitzb. Akad. Wiss. Wien, Abt. IIa* 130, 149-57 (1921).—A partial building up of the C, N and O nucleus out of  $H^{(2)}$  particles is excluded on the basis of the upper limit deduced for the at. wt. of this isotope of H. Calcs. of the at. wt. of  $H^{(2)}$  and the at. wt. of the He isotope,  $X_3$ , from the at. wts. of N and O, show that only in the case of  $X_3$  do the deviations from Coulomb's law agree with the results obtained with  $\alpha$ -particles. With the aid of the results obtained for  $X_3$ , the value 1.999 has been calcd. for the at. wt. of  $H^{(2)}$ . The assumption of the existence of an isotope of Li of mass 4 leads to a very small cohesion energy for this hypothetical atomic nucleus. H. JERMAIN CREIGHTON

Magnetism and atomic structure. II. The constitution of the hydrogen-palladium system and other systems. A. E. OXLEY. *Proc. Roy. Soc. (London)* 101A, 264-79(1922); cf. *C. A.* 15, 1450.—Pd on occluding H suffers a decrease in magnetic susceptibility which was exptly. detd. as ranging from 20 to 75% according to conditions. As the H is oxidized in contact with air the susceptibility increases. The decrease is too great for either gaseous or condensed mol. H; while free at. H would have caused an increase. The results are explained by assuming a loose combination where the electron of the H atoms is shared with the Pd increasing the electrons in the outer shell of the latter to the same number as possessed by diamagnetic Ag. The results are in accord with the Lewis-Langmuir theory of magnetism (*C. A.* 13, 1554). F. O. A.

The hydrogen molecule. III. H. CREHORE. *Phil. Mag.* 43, 1025-38(1922); cf. *C. A.* 16, 377, 2448.—A calcn. of the whole field around a central H atom as affecting a second atom in which it is assumed that the axes of revolution of the two atoms are parallel but not co-axial. The only two forces having existence for the form of model assumed are the electrostatic force and the force due to revolution of the positive and negative charges upon their axes. The inverse-square law is used in all cases. Diagrams

are given to show the distribution of the field of force under different assumptions. The stability relations are directly detd. by the plots. The energy of dissociation of  $H_2$  also is dealt with, and the difficulties are recited which are encountered in attempting to interpret heats of reaction along the lines of electronic energetics. The important general conclusion is reached that the chief condition of stable equil. is independent of any special form of electrodynamic theory (Saha or Lorentz) since it depends principally upon the electrostatic force, which all theories agree follows the inverse-square law.

S. C. L.

The property and theory of the sound increase in a discharge tube with high gas pressure. ERICH MARX. *Ann. Physik.* 67, 77-126(1922).—The mechanism of changing intensity of sound with changing e.m.f. is explained and a theory is developed which is confirmed by exptl. observation.

F. O. A.

The determination of the elementary electric charge by means of the "shot effect." J. B. JOHNSON. *Ann. Physik.* 67, 154-6(1922).—A corrected integration of an equation given by Schottky (*C. A.* 14, 3581) brings the results of C. A. Hartmann (*C. A.* 15, 2579) for the elementary elec. charge to the correct order of magnitude.

F. O. A.

The controversy over the electron. R. BÄR. *Naturwissenschaften* 10, 322-7, 344-50(1922).—An outline of the development and present knowledge concerning the electron, including a bibliography.

C. C. DAVIS

Surface ionization. MARIA HORNYAK. *Sitzb. Akad. Wiss. Wien, Abt. IIa* 130, 135-47(1921).—The influence of the form of the field in a plate condenser, with different distances between the plates, has been investigated. With a distance of 11 cm. between the plates it is still homogeneous. Further, the form of the current-potential curve is not appreciably influenced by the ionic blast (Ionenwind). Attempts were made to obtain surface ionization by varying the distance between the plates, and the dependence of the form of the curve on the current strength and the ratio of the residual range and the distance between the plates were studied. The curve agrees with the theoretical curve of Rutherford only up to about 4 v./cm. With a distance of 11 cm. between the plates, a p. d. of 10 v., a range of 1.4 cm. and a "prepn. strength" of about 68 e. s. u., agreement has been obtained with Rutherford's theoretical curve. At higher potentials than 15 v., the assumption is no longer true that the potential fall towards the ionizing plate is equal to zero.

H. JERMAIN CREIGHTON

Notes on ionization in the solar atmosphere. H. N. RUSSELL. *Astrophys. J.* 55, 354-9(1922).—The probable effect of the adsorption of photospheric radiation is treated in connection with the ionization of the alkalis and alk. earths in the solar atm. The behavior of Li appears to be anomalous; the difference in behavior of Ba and Na is ascribed to the far greater absorption due to the neutral atom of the latter. The strong solar lines due to Ba are caused by the ionized atom, with certain weak lines arising from the neutral atom. Three enhanced lines of Rb are found. The behavior of solar lines due to Mn agrees with an ionization potential of 7.6 volts.

K. BURNS

A determination of the number of alpha particles per second emitted by thorium C of known gamma-ray activity. A. G. SHENSTONE AND H. SCHLUNDT. *Phil. Mag.* 43, 1038-47(1922).—An exptl. detn. of the relative no. of  $\alpha$ -particles emitted by Ra C and Th C when the hard  $\gamma$ -radiations are equal. A large number of  $\alpha$ -particles were counted on a ZnS screen, by means of a revolving wheel with a slot subtending a small arc to reduce the total no. within convenient counting limits. Only the  $\alpha$ -particles of range 6.96 for Ra C and of 8.6 for Th C were allowed to reach the screen for counting. The ratio of  $\alpha$ -particles from the two sources was found to depend somewhat on the Pb screening to which the  $\gamma$ -radiation is subjected. For Pb 3.3 mm. thick the ratio of  $\alpha$ -Th C to  $\alpha$ -Ra C is 0.75 for equal  $\gamma$ -radiation. This value falls steadily with increased

screening to one of 0.71 at 14.3 mm. of Pb. All exptl. details are fully described and the probable errors are carefully analyzed. S. C. LIND

**New studies on the color changes of minerals by radiations.** C. DOELTER. *Sitzb. Akad. Wiss., Wien Abt. I* 129, 399-430(1920).—Fluorspar, quartz, topaz, sapphire, rock salt, barite, apatite and other minerals were studied by observing the original color and the color after they were subjected to ultraviolet or Ra radiations or both, for varying periods of time. Colors are recorded by the numbers of Radde's *Farbenskala*, the results being assembled in 9 tables. Minerals of the same species from different localities and different samples of the same mineral from the same locality varied in the intensity of color and in the length of time required to assume their color. The velocity of decoloration of minerals colored by means of Ra radiations, by the subsequent action of ultraviolet rays and by the action of daylight, was studied. L. W. RIGGS

**Photogenic action of ultraradiations.** ALBERT NODON. *Compt. rend.* 174, 1061-2 (1922).—The sun and high atm. emit very penetrating radiations which cause the discharge of electrified bodies. Their photogenic action is shown by enclosing a radiographic plate in a black carton absolutely opaque to light, then exposing the carton to sunlight for a prolonged period, when no photographic impression is obtained. If openings are cut in the carton and sheets of Fe, Zn, Al, or Mg are fitted into these openings, the plate is still unaffected by sunlight. On replacing these metals with metals of high valence such as Pb or U, an intense photographic impression is obtained. L. W. RIGGS

**The interaction between radiation and electrons.** C. F. RICKERDIKE. *Phil. Mag.* 43, 1064-70(1922).—A theoretical discussion of the mode of absorption and irradiation of energy between electrons and the ether. By making certain assumptions as to the nature of the ether it is possible to deal with the partition of energy, assuming Newtonian laws without involving the necessity of the frittering down of all energy into the smallest movements. The question as to whether ether with the properties assumed would fit in explaining other phenomena in which the ether is supposed to take part is not considered. S. C. L.

**The abnormally long free paths of electrons in argon.** J. S. TOWNSEND AND V. A. BAILEY. *Phil. Mag.* 43, 1127-8(1922); cf. *C. A.* 16, 2070.—Notes on the measurement of the mean free path of electrons in a mixt. of H<sub>2</sub> and A. At 8.5 v. per sec. with a velocity of agitation of  $4.2 \times 10^7$  cm. per sec., the mean free path in A is 80 times as long as that in H<sub>2</sub> at the same pressure. Further work is contemplated on mixts. S. C. L.

**Viscosity of air in a transverse electric field.** SATYENDRA RAY. *Phil. Mag.* 43, 1129-34(1922).—An expt. to test whether the viscosity of air is affected by a transverse elec. field. A flow method was used for the viscosity. A potential of 18000 v. per cm. was applied and a negative result good within 0.3% was obtained. S. C. L.

**X-ray electrons.** R. WHIDDINGTON. *Phil. Mag.* 43, 1116-26(1922); cf. *C. A.* 16, 380.—An app. and method are described to det. the velocity of the electrons liberated by X-rays impinging on different metallic elements. X-rays from a Rh target were employed and a magnetic deflection method was used to det. the velocity of the electrons. The frequency  $\nu$  is calcd. from the quantum relation. Comparison is then made between  $\nu$  found and that to be expected from the orbital position of the electrons. In general the agreements are very good. For Cu, 9 sets were measured from 172 to 552; for Zn(O) 7 from 189 to 456; for Al 2 from 448 to 502; for As<sub>2</sub>(O<sub>3</sub>) 6, 223 to 563; for Sr(O) 6, 292-544; for Mo(O<sub>2</sub>) 3, 361-475; for W(O<sub>2</sub>) 8, 164 to 544; for Bi<sub>2</sub>(O<sub>3</sub>) 6, 207 to 538. Electron emission increases in direct proportion to the at. no. Whenever a frequency difference might have been expected less than the K (or L) lines resulting, no corresponding line was observed. S. C. LIND

**The spectra of X-rays and the theory of atomic structure.** D. COSTER. *Phil.*

**Mag. 43, 1070-1107(1922).**—A very comprehensive paper divided into 3 parts. In part I are discussed Bohr's theory of spectra and its application to X-ray spectra by Sommerfeld, Kossel and others. The inert gases are used to illustrate the no. of electrons in the different orbits and their relation to spectral lines. The differences from and analogies between X-ray and visible spectra are pointed out. In part II new X-ray spectral data for the elements from Rb to Ba are presented and examd. with reference to their bearing on at. structure. In part III the results are more fully discussed; the series lines of the different elements are compared in the light of general theory. For the exptl. data and details of the discussion reference must be had to the original.

S. C. L.

**The selection principle of the quantum theory.** N. BOHR. *Phil. Mag.* 43, 1112-6 (1922).—A note in which B. expresses doubt as to the sufficiency of the evidence presented by Foote, Mohler and Meggers (*C. A.* 16, 2254) to support an exception to the principle of selection. B. believes that the evidence may be interpreted as a rather strong support of the general theory instead of an exception to it.

S. C. L.

**The Stark effect for alkalis.** RICHARD BECKER. *Z. Physik* 9, 332-18(1922).—A theoretical investigation indicates that an approx. formula for the quadratic Stark effect for alkali metals is arrived at by assuming that the disturbing action of inner electrons upon the orbit of the radiating electron can be accounted for by a term  $C_1/\gamma^4$  added to the potential energy. The calcs. are compared with observations on Na and Li.

W. F. MEGGERS

**The question of polarized light from dye solutions.** S. I. VAVILOV AND V. L. LEVSHIN. *Physik. Z.* 23, 173-6(1922).—Expts. are described which contradict Weigert's contention (*Verh. phys. Ges.* 23, 100(1921)) that all fluorescent light may be polarized. Among solns. of the same dyes, only two showed a polarized fluorescence when illuminated by light from a carbon arc through a Nicol prism, and then only under conditions which allowed the observed radiation to be made up predominantly of Tyndall effect. The spectrum of this radiation included also a red component which was absent in the true fluorescent spectrum. The polarization was absent in a dye soln. which had stood 24 hrs. in the dark, but it appeared during illumination, owing presumably to coagulation and formation of colloidal particles capable of showing the Tyndall effect.

G. R. FONDA

**Selenium.** WILHELM SPÄTH. *Naturwissenschaften* 10, 14-7(1922).—A review of elec. phenomena with references.

C. C. DAVIS

**Selenium cells and light telephony.** H. THIRRING. *Z. tech. Physik* 3, 118-20 (1922).—Despite the disadvantages of high and variable resistance and of inertia, the Se cell has a characteristic which makes its use possible in telephony. It is capable of changing in resistance in a period of illumination less than 1/1000 sec. so that if the source of light is given an interrupted frequency, the cell will have, superimposed on its d. c., an a. c., which may be amplified and transformed into tones of corresponding frequencies. There is apt to be noise from additional irregular variations in resistance. The Se surface should be small to obtain uniform light distribution.

G. R. FONDA

**The arc spectra of gallium and indium.** H. S. UHLER AND J. W. TANCH. *Astrophys. J.* 55, 291-301(1922).—Previous data for Ga and In being very incomplete, a new study has been made, with a one-meter concave grating, a large quartz prism spectrograph, and a 21-ft. concave grating. The lines were identified, by the use of especially pure material, on the first two instruments, and measured accurately on the last. The wave lengths are recorded to 23 Ga lines and 28 In lines, lying between  $\lambda 4500$  and  $\lambda 2170$ . Nearly all of these lines were found to belong to the two subordinate series, but none of the usual spectral formulas gave a satisfactory representation. An attempt to obtain an absorption spectrum of In was not successful.

R. T. B.

**The difference between series spectra of isotopes.** P. ENKJEFEST AND N. BOHR. *Nature* 109, 745-6(1922).—Bohr's equation for the ratio of the radiated frequencies of corresponding spectral lines of isotopes applies only to atoms having but one electron, e.g., H and ionized He. No relation is known for the more complex atoms in which the effect of the inner electrons on the nucleus will play an important part. In fact, it is possible to picture a state of the atom in which the radiated energy is independent of the nuclear masses involved in B.'s equation; or the motion of the radiating electron may be such as to modify greatly the effect of the nuclear mass from that calcd. for an atom with one electron.

C. C. KIRSS

**The phenomenon of the "radiant spectrum" observed by Sir David Brewster.** C. V. RAMAN. *Proc. Roy. Soc. Edinburgh* 42, 24-5(1922).—The "radiant spectrum" consists of a patch of light, exhibiting streamers radiating from its center, lying in the continuation of the spectrum well beyond its violet end, and observable whenever the spectrum of a small brilliant source of white light formed by a prism or grating is viewed directly with the eye. This is analogous to the phenomenon observed when a similar source of white or monochromatic light is viewed directly by the eye. These phenomena, which were described by R. in a previous paper, are diffraction effects attributable to the particles of const. size present in the refractive media of the eye. To demonstrate that diffraction is the cause of the observed phenomenon it is sufficient to hold a glass plate dusted with lycopodium to the face of a prism and view a source of light through it. The diffraction-halo produced by the dust grains on the plate is observable well beyond the violet end of the spectrum, the various colored rings and streamers composing it being dispersed by the prism. The conclusion is that the "radiant spectrum" is also a diffraction effect due to structures within the eye itself.

C. C. KIRSS

**The L-series of lutecium and ytterbium and the identification of cerium with the element of atomic number seventy-two.** A. DAUVILLIER. *Compt. rend.* 174, 1347-9 (1922).—The mixed oxides of Lu and Yb prepd. by Urbain were submitted to X-ray analysis. A modification of the app. used in previous work permitted D. to secure well exposed plates in fairly short time, using current of 40 kv. and about 20 watts. A table is given which contains lines observed in the L-series of Lu and Yb. The recorded wave lengths are included between the limits  $\lambda = 1141$  and  $\lambda = 1618$ , the unit of measurement being  $10^{-11}$  cm. These wave lengths were measured with respect to the lines of the K-series of Cu detd. by Siegbahn. In addition to the tabulated lines there were observed faintly several lines belonging to Tu and also two very feeble lines which indicate the presence of cerium in the material used. The possibility of assigning these lines to other elements is excluded and the fact is established that cerium is an element of at. no. 72.

C. C. KIRSS

**Spectroheliographic investigations of the arc light.** R. G. BERTHOLD. *Physik. Z.* 23, 178-84(1922).—An app. was used similar to Oldenberg's (C. A. 8, 1052) by which monochromatic photographs of the arc could be obtained. With the d. c. arc Oldenberg's results were confirmed by showing that the principal and second subordinate series of the Na lines are emitted from the edge of the arc and the first subordinate series from further within. As the vapor pressure of a salt in the electrode was varied, it became apparent that its cond. detd. the appearance of its spectrum at the center of the arc. In expts. with a. c., when a dark space appeared at the anode, at the instant of no current, the intensity of the Na bands of the second order reached a max.

G. R. FONDA

**The regularities of band systems.** A. KRATZER. *Ann. Physik* 67, 127-53(1922).—The theoretical foundation of the Heurlinger formula for the zero lines of band series is extended by quantizing the inharmonic oscillator, since band spectra are assumed to arise in the superposition of electron frequencies upon the rotations and nuclear vibra-

tions of mols. This formula is numerically evaluated for the  $O_2$  bands and for the CN violet bands. From the assumption of inharmonic vibrations of the nucleus, the dependence of the consts. in Delandres' band-series formula upon the oscillation quantum no. is developed and found to be confirmed by the observational data. With the help of this relation the entire system of CN bands is completely analyzed. All the lines of the CN violet bands are represented by a 9-const. formula based on theory. A simple way to represent terms and interpret the CN red bands and the  $N_2$  bands is indicated.

W. F. MEGGERS

**The quantum theory of band spectra and its application to the determination of temperature.** R. T. BIRGE. *Astrophys. J.* 55, 273-90(1922).—An excellent summary of recent work on the structure and theory of band spectra is given. Each true band consists of one series having 2 similar branches. The common origin of these 2 branches is a line of zero intensity, and is labeled  $m = 0$ . From this point the positive branch runs toward longer waves and successive lines are designated  $m = +1, +2$ , etc. The negative branch runs in the opposite direction and the lines are designated  $m = -1, -2$ , etc. Successive lines are not equally spaced but crowd closer together in one direction until the series presently reaches a turning-point, where the sepn. of successive lines has become zero, and then turns back on itself. This turning point has always been known as the "head" of a band. Either the + or — branch may thus invert. In the former case, illustrated by the CN band 3883 Å., the band is said to be degraded toward the violet, while in the latter case, illustrated by the halogen acid infra-red bands, the band is said to be degraded toward the red. There is no essential difference between the structure of near infra-red bands and many ordinary bands in the visible and ultra-violet spectrum. In the case of near infra-red bands, each branch changes with temp., the point of max. intensity moving toward a higher value of  $m$  as the temp. increases. The main purpose of the present investigation was to make a quant. study of this matter for the CN band 3883 Å., since in the case of discontinuous emission and absorption by vapors, no other method of quant. temp. detn. is as yet known, and any results, even if approx., should be of value in both terrestrial and astronomical work. It is shown that Kemble's formula,  $m_{\text{max.}} = 0.699T/\Delta\nu_0$ , for the no. of the line of max. intensity as a function of abs. temp. and limiting sepn. of successive lines, a formula based on the statistical distribution of angular velocity given by the quantum theory, may be expected to give fairly accurate values of  $T$ , though it neglects some factors. Evidence is presented to show that this formula holds not only for infra-red bands but also for the CN band 3883 Å. A careful study of spectrograms of this band indicates that  $m_{\text{max.}}$  varies from 9  $\pm$  2 for light from a discharge tube contg. active N at about 100° to 23  $\pm$  2 for light from a furnace at 2500° to 2700°, while the values computed from Kemble's formula for the resp. temps. are 8.4, 22.9 and 23.7. This agreement justifies the use of the formula to det. the approx. temp. in the case of arcs, the sun, and similar sources which emit or absorb CN bands. In this way the temp. of a 13-amp. C arc is spectroscopically detd. to be 4500°  $\pm$  300 while that of a 4-amp. arc is 3900°  $\pm$  300. By comparing solar spectrograms with the arc spectrograms the temp. of 4000°  $\pm$  500 is obtained for the reversing layer of the sun. Many important details about the CN bands are given, the difficulties and sources of error in making temp. detns. from them are fully discussed and it is concluded that the present method with increasing theoretical knowledge, should be capable of fairly accurate quant. results. W. F. M.

**A continuous spectrum from mercury vapor.** C. D. CHILD. *Astrophys. J.* 55, 329-44(1922).—A continuous spectrum, probably identical with the fluorescence spectrum, is emitted by fairly pure Hg vapor at low c. d. ( $10^{-4}$  amp./cm.<sup>2</sup>) when the temp. is above 120° and below 300° or 400°, this last datum depending on the pressure, which must be more than 1 mm. This radiation does not arise from ionized atoms. It

may be due to mols. which have been influenced by radiation of wave length 2536 emitted by atoms struck by electrons with energies corresponding to 4.9 volts or more. The ionization potential of Hg appears to vary with the temp., reaching a minimum at 140°, where it is 3 volts less than at 50°. Above, but not below, 120° Hg vapor reacts with air to form a compd. and this reaction is associated with the appearance of the continuous spectrum. Preliminary expts. indicate a similar continuous spectrum for Na vapor, but it is far weaker than the line spectrum. K. B.

**The relation between chemi- and photoluminescence of unsaturated silicon compounds.** H. KAUTSKY AND H. ZOCHER. *Z. Physik* 9, 267-84(1922); cf. C. A. 15, 3796.—The luminescence of colored silical compds. particularly the hydroxide ( $\text{Si}_2\text{OH}$ )-OH is studied. The color of light emitted during oxidation of mixts. of colorless  $\text{Si}_2\text{H}_2\text{O}$  and red ( $\text{Si}_2\text{OH}$ )-OH changes from green through yellow to red with increasing concn. of hydroxide and so with increasing redness of the mixt. The intensity of the luminescence is greatest with preps. having the lowest concn. of hydroxide which emit yellow light. The amt. of light emitted by a given amt. of substance is greatest at low temp. The spectrum consists of a broad band from red to blue. The photochem. oxidation of  $\text{Si}_2\text{H}_2\text{O}$  with  $\text{EtI}$  and  $\text{H}_2\text{O}$  to ( $\text{Si}_2\text{OH}$ )-OH is accomplished by light of short wave length, the oxidation product acting autocatalytically. The oxidation of red ( $\text{Si}_2\text{OH}$ )-OH to a colorless leuco compd. of unknown compn. is hastened by light of short wave length, the bleaching taking place even with a dry sample in a vacuum. The photochem. oxidation of the red hydroxide emits light which varies in color and intensity with the concn. of the colored compd. in the same manner as the chemiluminescence. At the temp. of liquid air the chem. reaction is reduced to a min. but the photoluminescence is greatly increased. The color of luminescence in liquid air and under the influence of cathode rays is the same as the chemiluminescence of a substance of the same compn. Both the chemiluminescent and the photoluminescent light of single particles of ( $\text{Si}_2\text{OH}$ )-OH are polarized. The luminescence in every case is probably caused by non-reacting mols. of ( $\text{Si}_2\text{OH}$ )-OH. The transfer of energy from mol. to mol. plays an important role in all the luminescence phenomena investigated. HARRY B. WEISER

**Velocity of reaction of the photochemical dissociation of ferric chloride (preliminary note).** E. PUXEDDU AND F. L. VODRET. *Gazz. chim. ital.* 52, I, 229-34(1922).—P. (C. A. 14, 3368) found that in sunlight  $\text{FeCl}_3 \longrightarrow \text{FeCl}_2 + \text{Cl}$  in pure anhyd.  $\text{Et}_2\text{O}$ , and that the free Cl chlorinates the  $\text{Et}_2\text{O}$ ; this prevents the reversal of the reaction. The photochem. reaction is rapid but measurable. The beginning of the reaction is manifested by the appearance of a turbidity and then  $\text{FeCl}_2$  seps. on the bottom and sides of the container. Velocity detns. were made in sunlight and in the light of an arc lamp at const. temp. Sublimed  $\text{FeCl}_3$  was dissolved (0.37 g. mol. or less in 1000 cc.  $\text{Et}_2\text{O}$ ) in anhyd.  $\text{Et}_2\text{O}$ . Equal amts. were simultaneously exposed to the light in sealed tubes and at the proper intervals removed and extd. with  $\text{H}_2\text{O}$ . The  $\text{FeCl}_2$  formed was detd. with  $\text{KMnO}_4$ ; a few cc. of Zimmermann's soln. was added previously. The results were calcd. by the monomol. equation. At high  $\text{FeCl}_3$  concns. a black substance is formed that interferes with the detns. The influence of temp. is marked. The reaction is complete in 1 hr. Good constns. for the monomol. equation were obtained for the 1st 30 mins. At the same temp. the decompn. is much slower in the light of the arc and the  $\text{FeCl}_2$  ppt. is less voluminous and more transparent than that formed in sunlight. This work is to be continued. E. J. WITZEMANN

**Phototropy of inorganic salts. Cuprous chloride and bromide.** GOPAL SINGH. *J. Chem. Soc.* 121, 782-5(1922).—On exposure at 20° to direct sunlight under  $\text{H}_2\text{O}$  slightly acidified with  $\text{H}_2\text{SO}_4$ ,  $\text{CuCl}$  becomes first grayish blue then dark blue and finally dark Cu-colored, assuming a metallic luster after a few min. exposure. If an exposed sample is kept in the dark at room temp. the reverse changes in color take place, the sample

regaining its original white color in 48 hrs. CuBr exhibits phototropy in a similar manner. The phenomenon is a property of crystals and not of solns. of the salts. Violet light and a low temp. are most favorable for producing the darkening while high temps. hasten the discoloration. The sensitiveness to light decreases with increasing concn. of acid. Wöhler's view (*Ann.* 130, 273(1864)) that the coloring is due to the formation of an oxychloride is shown to be untenable. A suggested explanation is that that darkening in the presence of light is caused by the formation of some kind of colored hydrate which is instable in the dark and therefore decomposes when kept in the dark; but there is no exptl. evidence to support this hypothesis. HARRY B. WEISER

A precision X-ray spectrometer. H. M. TERRILL. *J. Optical Soc. Am. Rev. Sci. Inst.* 6, 287-90(1922). E. H.

Becquerelite, a new radioactive mineral (SCHORFF) 8. Sodditite, a new radioactive mineral (SCHORFF) 8.

La structure de la matière. Paris: Gauthier-Villars. 324 pp. Reviewed in *J. chim. phys.* 9, 265(1921). Contains the reports and discussions of the Conseil de Physique held at Brussels in 1913.

Medical uses of Radium. Studies of the Effects of Gamma Rays from a Large Quantity of Radium. London: H. M. Stationary Office. 5s.

MIALL, STEPHEN: The Structure of the Atom: Notes on some Recent Theories. London: Benn Bros. Ltd. 26 pp. 1s. 6d. Reviewed in *Nature* 109, 710(1922).

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

Geography of electrochemistry. W. S. LANDIS. *J. Ind. Eng. Chem.* 14, 554-5 (1922).—Hydro development possibilities of the five continents and the East Indies are discussed. The struggle for supremacy will be between the United States, Norway, India, China and Canada. W. H. BOYNTON

The electric steel furnace. F. ROWLINSON. *Electrician* 88, 506(1922).—In order to produce elec. steel of the best quality the same care must be applied as in crucible practice. C. G. F.

Electric steel plant at the Southern Pacific shops. L. J. BARTON. *Chem. Met. Eng.* 26, 838-40(1922).—A steel-making plant comprizing a 6-ton Heroult elec. furnace with equipment for making ingots and castings is described. The installation of the elec. furnace was made after a careful comparison of cupolas and converters, open-hearth and elec. furnaces for working up the available scrap. The elec. furnace was selected as the most suitable on the basis of the superior quality of elec. steel, a slight advantage in cost of the finished steel, and the adaptability of the elec. furnace to a wide variety of products. The basic process was chosen since the available scrap was high in S and P on account of large quantities of wrought Fe mixed with it. Operation of the furnace follows the standard 2-slag process. Data from 2 years' continuous operation show an av. power consumption of 565 kw. hr. per ton of charge; electrode consumption of 30 lb. of carbon or 12 of graphite per ton of product. The bottom of dead-burned magnesite is still in good condition after 2 years of const. operation. This furnace has been used in the production of rivet steel, tie plate steel, steel castings, and synthetic cast Fe. LOUIS JORDAN

A comparison between shaft and open-top furnaces in the manufacture of pig iron electrically from ore. R. C. GOSROW. *Trans. Am. Electrochem. Soc.* 41 (advance



copy) (1922).—With the beginning of the elec. reduction of Fe ores the furnaces were patterned after the Fe blast furnace and constructed with stacks. It is claimed that the shaft furnace is of advantage for preheating and drying wet ore and for calcining carbonate ores; reduction is said to be accelerated by the use of stacks. The former claim is justified; the latter remains to be proved. The charge in a shaft furnace tends to segregate and to become finer in size as it travels from the top of the stack to the smelting zone, thus causing a change in the anticipated conductance and resistance of the charge. Hangups and subsequent slips cause the abrupt entry of cold unused material into the incandescent zone, resulting in a drop in the elec. load. Stacks are not necessary. Hence the development of the open-top furnace in which the charge has a shorter travel, thus eliminating many of the serious difficulties encountered in the stack furnaces. The rectangular open-top furnace is a better smelter than the circular furnace. Open-top furnaces are less severe on the refractories. Large units of 7,000 to 10,000 kw. capacity will become the practical units for Fe smelting. Cost estimates are given for furnace, plant, and pig Fe. The cost of the latter is \$39.66 per net ton. L. J.

**The electric furnace in the iron foundry.** LYMAN C. JUDSON AND HARRY P. MARTIN. *Trans. Am. Electrochem. Soc.* 41 (advance copy) (1922).—A bibliography, briefly abstracting each reference. LOUIS JORDON

**Synthetic cast iron.** JAS. L. CAWTHON, JR. *Trans. Am. Electrochem. Soc.* 41 (advance copy) (1922).—The production of synthetic cast Fe consists of melting scrap in the acid or basic elec. furnace with coke, oil still residue, or coal to give the necessary C content to the Fe, and making adjustments in the percentages of Mn, Si, S, and P to give the desired characteristics in the finished metal. In melting steel scrap under recarbonizing conditions it is almost inevitably the case that the heat will melt down with a C content of 2.50 to 2.75 % even though a great excess of C be introduced into the furnace during the melting operation. The raising of the C above that point requires a certain amt. of time and a very hot bath. The only method of obtaining C contents well over 2.75 % is to use a combination of very hot metal, a clean bath, and vigorous agitation (e. g., by the introduction of a green pole) for a fairly well sustained period. The adjustment of the Si content is made by the addn. of 50 % Fe-Si. In the basic furnace this addn. should be made at the very last of the heat. In the acid furnace a percentage of Si may be reduced from the slag. Practically all the Mn in steel scrap is retained when the melting is done on a basic bottom. Additional Mn, if necessary, can be added at any time or included in the charge. In acid practice addns. of Mn should be made just before the metal is tapped, or even in the ladle. Marked reduction of S occurs in the basic furnace. No reduction of S is practicable in the acid furnace. The only precaution which can be taken in the latter case is to make certain that the S is balanced by the necessary amt. of Mn, i. e., 2 or 3 times the amt. theoretically necessary to absorb the S as MnS. Since the only advantageous function of P in cast Fe is fluidity which is obtained in the elec. furnace by temp. increase, the P may be materially reduced in synthetic grey iron. The use of Brinnell hardness as a quick testing method for the control of the C and Si contents is described. A *graphic method for figuring charges* which simplifies the calcs. and eliminates the major portion of them is explained. LOUIS JORDON

**The use of the electric furnace for brass melting, and for the heat treatment of steels.** A. STROMBOLI. *Rass. min.* 56, 82-3(1922).—The advantages of the Bailly furnace, with data obtained on a large scale in the U. S., are summarized from previous reviews (cf. C. A. 14, 19; 13, 2159). C. C. DAVIS

**The removal of alkali from salts by electrolysis.** A. LOTTERMOSER. *Kolloid-Z.* 30, 346-8(1922).—A clay cell contg. 200 cc. of soln. in which were dissolved 51 g. of  $\text{Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$  stood in a vessel contg. 750 cc. of 0.1 N NaOH. A Pt cylinder which formed

the anode dipped into the tungstate soln. A current of 2 amps. was used. After the electrolysis was completed, large, glassy crystals were obtained from the anode soln. which were shown by analysis to be paratungstate. This method of electrolytic acidulation may be used for molybdates, vanadates, tantalates, columbates, and all salts capable of forming acid salts such as, sulfates, phosphates, arsenates, etc. H. M. McL.

**Electrical tests for porosity of electrical porcelain.** J. R. SHRADER. *Elec. J.* 19, 118-9(1922).—The most important property of elec. porcelain is its dielec. strength, which is in turn indicated by power-factor and resistance. A simple test to det. how moisture absorption affects the latter properties is described. Four insulators of known history were dried overnight at 200° and after cooling filled with Hg and floated in a shallow tray of Hg. The power-factor was measured by a sensitive electrostatic wattmeter and the resistance with a sensitive high-resistance galvanometer. The Hg was then replaced by water and the measurements were immediately repeated. The insulators were allowed to stand in water for 7 days, measurements being made at intervals. Curves for the power-factor of each insulator are shown. Resistance measurements showed that the poorest one had a different moisture absorption. Dielec. tests on these insulators showed that this one punctured at low voltage. Further soaking tests in water and in dye showed that the recorded results are characteristic. The power-factor detn. is very good and a sure indication of moisture absorption which is an indication of the porosity of the porcelain. Resistance measurements only distinguish a good insulator from a poor one. The const. slope of the poor insulator may indicate failure under high potential when sufficient moisture has been absorbed and may be the cause of the deterioration of apparently good insulators on storage or long service. The work shows the direct relation between the power-factor of insulators and their dielec. strength and that barring mechanical troubles or faulty design it depends upon moisture absorption as a result of porosity.

W. H. ROYNTON

**Modern tungsten lamp manufacturing at Dalston.** ANON. *Electrician* 88, 630 (1922).—A brief illus. account. C. G. F.

**The manufacture of the Mullard valve.** ANON. *Electrician* 88, 317-9(1922). C. G. F.

**The electrostatic watt meter.** G. L. ADDENBROOKE. *Electrician* 88, 468-8(1922). C. G. F.

**A simple generator of high-frequency current for measurement purposes.** J. M. *Electrician* 88, 436-8(1922). C. G. F.

Heat treatment of large forgings by oil, gas and electricity (McGAHEY) 9. Electrical porcelain research (HUNT) 19. Developments in electric vitreous enameling furnaces (CARPENTER) 19.

**Storage battery.** F. G. MANWARING. U. S. 1,419,396, June 13. Structural features.

**Storage battery.** E. A. BERRY. U. S. 1,419,208, June 13. Structural features.

**Dry-cell electric battery.** D. ROSEN. U. S. 1,417,692, May 30. The upper portion of the battery casing is formed into a reservoir for holding liquid electrolyte which may be allowed to run through a valve into the main charge of the battery when desired to activate it.

**One-piece zinc cups for dry-cell electric batteries.** E. L. GASTON. U. S. 1,419,839, June 13. Pure Zn cups are formed by electrolytic deposition on an Al support from which they are stripped after removal from the electrolyte.

**Electrolytic cell adapted for generating hydrogen and oxygen.** J. HARRIS. U. S. 1,420,037, June 20.

**Electrolytic purification of iron.** A. J. MOXHAM. U. S. 1,420,128, June 20. Fe is sepd. from solns. such as Fe chloride by electrolysis and the acid set free by the electrolysis is neutralized by combination with  $\text{NH}_3$  in order to prevent redissolving of the sepd. Fe.

**Electric furnace adapted for melting metals.** W. K. BOOTH. U. S. 1,418,773, June 6. The furnace lining is formed of molded replaceable sections.

**Electric furnace for producing zinc or other volatile metals.** F. THARALDSEN. U. S. 1,417,953, May 30. A furnace with a vertical electrode extending into it through the roof is connected through a dust-collecting chamber to an inclined condensing conduit, which is provided with ventilating shafts at intervals throughout its length to permit escape of gases to a boiler furnace, where they are burned.

**Electric resistance furnace adapted for melting brass or aluminium.** H. G. WEIDENHTHAL. U. S. reissue 15,378, June 6. Original pat. No. 1,304,425, C. A. 13, 1977.

**Electric furnace adapted for heating metals or ores.** C. N. SPEIRS. U. S. 1,418,030, May 30. The furnace comprizes a crucible heated by elec. resistance.

**Preparing iron for electroplating.** R. J. FLETCHER. U. S. 1,417,896, May 30. Fe or Fe alloy is cleansed by making it the anode in an acid bath of a Cu salt. Cf. C. A. 15, 2038.

**Malleabilizing iron castings.** O. SOWERS. U. S. 1,417,638, May 30. An elec. current is passed through Fe castings such as open-topped kettles with the bottom thicker than the walls and the current is so regulated that more of it passes through the thicker portion than through the thinner portion. After several hrs. treatment, the character of the C is altered so as to malleabilize the Fe.

**Electric lighting device.** J. COULSON. U. S. 1,419,360, June 13. Film-forming electrodes of an alloy including Al, Mn and Cu are placed in an electrolyte such as citric acid or  $\text{NH}_4$  citrate, carbonate, borate or borotartrate within a transparent container, to produce light on passing an elec. current between the electrodes.

## 5—PHOTOGRAPHY

LOUIS DERR

**Manufacture of photographic dry plates.** M. MIYADA. *J. Chem. Ind. (Japan)* 24, 884-906(1921).—M. prepd. high-speed photographic dry plates according to Eder's ammoniacal method and studied various well known factors which influence the ripening of emulsion. The plates thus prepd. gave a speed of  $13^\circ$  Scheiner, while the mean speed of imported com. plates showed  $15.5^\circ$  Scheiner. The effect of various factors shows that at the best Eder's ammoniacal method could not give a greater speed than  $13^\circ$  Scheiner. Microscopic examn. shows that in general high-speed plates have larger grain of emulsion than the slower plates, and that imported plates contain more irregularities of grain size than that which M. prepd., the max. difference of the former being about 8 microns in diam. and M.'s own, 1-2 microns. M., therefore, prepd. an emulsion by mixing various emulsions which differed in the degree of ripening and which, therefore, differed in the size of the grains. The emulsion thus prepd., contg. much larger varieties of sizes of the grain, gave much higher speed ( $15^\circ$  Scheiner). S. T.

**Pinakryptol green.** E. KÖNIG. *Phot. Rundschau* 59, 133-4(1922).—This new desensitizer, to be added to the developing bath, is the green constituent of pinakryptol. Its advantage over pinakryptol (cf. C. A. 16, 1914) is its greater desensitizing power. It strongly colors the developing soln., but has an advantage over phenosafranine in that it does not stain the gelatin.

L. DERR

**Treating photographic plates or films with alcohol.** J. D. BAGLEY. U. S. 1,417,791, May 20. Exposed plates or films are wetted with alc., before introduction into the developing soln., in order to increase clearness of cloud effects and other pictures when developed.

**Antistatic photographic film.** A. F. SULZER. U. S. 1,418,405, June 6. A cellulose ether is mixed with nitrocellulose film compns. in sufficient amt. to render them antistatic.

**Positive photographs in relief.** R. JOHN. U. S. 1,417,328, May 23. A positive plate or film is treated with a developer which has a tanning effect on the particles of gelatin adjacent to the Ag particles acted on by the light.  $\text{Na}_2\text{SO}_3$  or other compd. is used to control the tanning action. This restrainer is used in smaller amt. than in a usual standard developer. After development, the plate or film is immersed in  $\text{H}_2\text{O}$  at about  $37^\circ$  to soften the sol. portions of the emulsion so that they slide off the support, leaving the image in relief. The latter is fixed with hypo and may be used in dye printing. Cf. C. A. 15, 2799.

## 6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

**The preparation and constitution of a double orthophosphate of potassium and sodium.** R. M. CORELLI. Rome. *Gazz. chim. ital.* 51, 11, 380-5(1921).— $\text{NaNH}_4\text{HPO}_4 \cdot 4\text{H}_2\text{O}$  is well known and  $\text{Na}(\text{NH}_4)_2\text{PO}_4 \cdot 4\text{H}_2\text{O}$  ( $5\text{H}_2\text{O}^?$ ),  $\text{Na}(\text{NH}_4)_3\text{PO}_4 \cdot 6\text{H}_2\text{O}$  and  $\text{Na}_2\text{NH}_4\text{PO}_4 \cdot (12\text{H}_2\text{O}^?)$ , have been prepd. Abegg (*Hdb. d. anorg. Chem.* 8, p. 331) erroneously quotes Felhol and Scnderens (*Compt. rend.* 94, 649(1882)) as having obtained  $\text{K}_2(\text{NH}_4)_2\text{H}_3(\text{PO}_4)_4 \cdot 3\text{H}_2\text{O}$ . K  $\text{NH}_4$  salts are unknown. Attempts to obtain the K  $\text{NH}_4$  salt by the methods used with  $\text{NaNH}_4\text{HPO}_4$  failed. The solns. on evapn. evolved  $\text{NH}_3$  continuously and the crystals obtained are  $\text{KH}_2\text{PO}_4$ . Thus the reaction that occurs  $\text{KNH}_4\text{HPO}_4 \rightleftharpoons \text{KH}_2\text{PO}_4 + \text{NH}_3$ , is interpreted as involving a profound hydrolysis in  $\text{H}_2\text{O}$  and the suppression of  $\text{NH}_4\text{OH} \rightleftharpoons \text{NH}_4^+ + \text{OH}^-$  by  $\text{KOH} \rightleftharpoons \text{K}^+ + \text{OH}^-$ , etc. The formation of a white cryst. compd. on adding concd.  $\text{NH}_4\text{OH}$  to a K phosphate soln. which decomposes rapidly in air and which keeps in a sealed tube containing  $\text{NH}_3$  indicated that such K- $\text{NH}_4$  compds. exist. This salt was best obtained by dissolving 3 g.  $\text{KH}_2\text{PO}_4$  in 10 cc.  $\text{H}_2\text{O}$  and passing in  $\text{NH}_3$  while cooling with ice and NaCl. The salt  $\text{K}(\text{NH}_4)_2\text{PO}_4 \cdot 4\text{H}_2\text{O}$  promptly sepd. This salt loses  $\text{NH}_3$  in the air and deliquesces. It is considered probable that  $\text{KNH}_4\text{HPO}_4$  is 1st formed but is converted into the tertiary salt by the excess  $\text{NH}_3$ .

E. J. WITZEMANN

**Progress in experimental inorganic chemistry from 1914 to 1918.** EDUARD MICHEL. *Fortschritte Chem.* 16, 1-29, 73-110(1920). C. C. DAVIS

**The complex nitrites of nickel.** V. CUTTICA. *Gazz. chim. ital.* 52, 1, 210-5(1922).—Along with other heavy metal nitrites  $\text{Ni}(\text{NO}_2)_2$  unites with nitrites of alkali and alk. earth metals to give double nitrites. These complexes because of similar color, stability and the constant no. of  $\text{NO}_2$  groups in the double salt are considered as derivs. of a quadrivalent group  $[\text{Ni}(\text{NO}_2)_4]$ . Co, Pt and Pd form "imperfect" complexes,  $[\text{K}_2\text{Co}(\text{NO}_2)_4]$ , with but 4 contravalences. Nevertheless the stability of the complex increases on passing from Ni to Pt. The double nitrites of Ni are transition forms which show both the constancy of the coordination no. of the double salts and the great mobility of the simple component ions in soln. Cryoscopic detns. on Ti Ni nitrite give a mol. wt. of 111 and 107, resp., which corresponds to the sepn. of the complex mol. into 9 sep. particles (out of a possible 11 ions). Further facts are given which indicate that  $\text{Ni}(\text{NO}_2)_2$  is not dissociated. C. extended his expts. to the triple nitrites (Erdmann, *J. prakt. Chem.*

97, 385; Przibylla, *Z. anorg. Chem.* 15, 432(1897-8); Reichard, *Chem.-Ztg.* 28, 479(1904)) and describes 3 of these complexes in this 1st report. Cold satd. solns. of  $\text{NiSO}_4$ ,  $\text{Cd}(\text{OAc})_2$  and  $\text{KNO}_3$  were mixed in the presence of large excess of  $\text{NaNO}_2$ . After about an hr. a yellow microcryst. salt sepd. This was filtered off with suction, and washed with  $\text{H}_2\text{O}$ ,  $\text{EtOH}$  and  $\text{Et}_2\text{O}$ . The triple *nickel cadmium potassium nitrite*, (A),  $\text{Ni}(\text{NO}_2)_2 \cdot 2\text{Cd}(\text{NO}_2)_2 \cdot 4\text{KNO}_3$ , thus obtained gives a yellowish green soln. in which the simple ions can be identified by the ordinary reactions. Mixing concd. solns. of  $\text{Ni}(\text{NO}_2)_2$  (from  $\text{Ba}(\text{NO}_2)_2 + \text{NiSO}_4$ ),  $\text{TlNO}_2$  and  $\text{Cd}(\text{OAc})_2$  in the presence of much excess of  $\text{NaNO}_2$  seps. *nickel cadmium thallium nitrite*, (B),  $\text{Ni}(\text{NO}_2)_2 \cdot 2\text{Cd}(\text{NO}_2)_2 \cdot 4\text{TlNO}_2$ , as a brick red microcryst. powder. Mixing satd. solns. of  $\text{NiSO}_4$ ,  $\text{Cd}(\text{OAc})_2$  and  $\text{NH}_4\text{NO}_3$  in the presence of much excess of  $\text{NaNO}_2$  seps. *nickel cadmium ammonium nitrite*, (C),  $\text{Ni}(\text{NO}_2)_2 \cdot \text{Cd}(\text{NO}_2)_2 \cdot 2\text{NH}_4\text{NO}_3$ , as a flesh-colored powder. Cryoscopic detns. for A gave 12.7-14.1 ions, for B 14.6-15.2 ions and for C 7.7-8.5 ions at various dilns. This shows that these complexes are profoundly broken up through the dissociating action of  $\text{H}_2\text{O}$  and that the last residue of complexity is represented by the incompletely dissociated mols. of  $\text{Ni}(\text{NO}_2)_2$  and  $\text{Cd}(\text{NO}_2)_2$ . These derivs. are briefly discussed from the point of view of the Werner system, and are considered as special cases of the type  $[\text{Me}^{\text{II}}(\text{H}_2\text{O})_6]^{2+}[\text{EC}]_2$  of Werner (*Neuere Anschauungen*, pp. 310(1913)) and  $[\text{Me}^{\text{II}}(\text{NH}_3)_4]^{2+}[\text{SO}_4(\text{ClO}_3)_2]^{2-}$  of Poma (*Gazz. chim. ital.* 40, II, 519(1910); *C. A.* 5, 1035) as follows:  $[\text{Ni}(\text{NO}_2)_2]_2^{\text{K}_4}[\text{Cd}(\text{NO}_2)_2]_2$  and  $[\text{Ni}(\text{NO}_2)_2]_2^{\text{Tl}_4}[\text{Cd}(\text{NO}_2)_2]_2$ . E. J. WITZEMANN

**Double halides of bismuth and thallium.** G. CANNERI and G. PERINA. *Gazz. chim. ital.* 52, I, 231-6(1922).—Bi halides have a tendency to combine with 1 or more mols. of halides of other elements. Thus  $\text{HBiX}_4$ ,  $\text{H}_2\text{BiX}_6$ ,  $\text{H}_3\text{BiX}_8$ ,  $\text{H}_4\text{BiX}_{10}$ ,  $\text{H}_5\text{BiX}_{12}$ ,  $\text{H}_6\text{BiX}_{14}$ ,  $\text{H}_7\text{BiX}_{16}$ ,  $\text{H}_8\text{BiX}_{18}$ ,  $\text{H}_9\text{BiX}_{20}$ ,  $\text{H}_{10}\text{BiX}_{22}$  are known.  $\text{Bi}(\text{CNS})_3$  behaves similarly with  $\text{HCNS}$ . In a previous paper C. (*C. A.* 16, 1715) showed that  $\text{BiI}_3$  combines with  $\text{TlI}$  and that the ppt. of  $\text{TlI}$  is quant. when  $\text{TlI}$  is present in excess. Ephraim and Barteczko (*C. A.* 3, 1128) found 2 chloride complexes:  $3^+ \text{TlCl} \cdot \text{BiCl}_3$  and  $6^+ \text{TlCl} \cdot \text{BiCl}_3$ . In this paper C. and P. have tried to complete the study of these complexes. Attempts to prep. a complex from  $\text{BiF}_3$  and  $\text{TlF}$  gave only amorphous mixts. of the 2 salts. When  $\text{TlF}$  was added to a soln. of  $\text{NH}_4\text{BiF}_6$  (Helmont, *Z. anorg. Chem.* 3, 143(1892)) mixts. rich in  $\text{NH}_4\text{BiF}_6$  were obtained on evapn.  $\text{Tl}$ , therefore, behaves like  $\text{K}$  toward  $\text{HBiF}_4$ .  $\text{Bi}_2(\text{CO}_3)_3$  dissolved in  $\text{HNO}_3$  and treated with  $\text{KBr}$  gives a yellow soln. from which on adding  $\text{Th}_2\text{SO}_4$  a microcryst. ppt. of *thallium bismuth bromide*,  $2\text{TlBr} \cdot \text{BiBr}_3$ , seps. This in abs.  $\text{EtOH}$  gives the reactions for  $\text{Br}$ ,  $\text{Tl}$  and  $\text{Bi}$ ; it is not stable in neutral aq. soln. but can even be recrystd. from acid soln. as yellow hexagonal plates. Upon addition of  $\text{KI}$  to an acid soln. contg.  $\text{Tl}$  and  $\text{Bi}$  *thallium bismuth iodide*,  $2\text{TlI} \cdot \text{BiI}_3$ , sepd. as wine-red microcrystals. If the alkali iodide is added to a soln. contg. an excess of  $\text{Tl}$  with respect to  $\text{Bi}$  both elements are quant. carried down in the ppt. An indirect method for *detn. of bismuth* was developed from this fact as follows: The unknown  $\text{Bi}$  soln. is acidified with  $\text{HCl}$  and treated with a known amt. (a) of  $\text{KI}$  soln. in excess. Then a known soln. of  $\text{Th}_2\text{SO}_4$  is added from a buret until the pptn. of the red double iodide gives way to the pptn. of yellow  $\text{TlI}$ . The I equiv. to the  $\text{Th}_2\text{SO}_4$  used is (b). The soln. is filtered through a Gooch crucible and the excess  $\text{KI}$  (c) detd. with  $\text{KIO}_4$ . Then  $\text{Bi}$  (in g.) =  $(208/380.76) (a - (b + c))$  when a, b and c are expressed in g. Good results in the analysis of known solns. were obtained.  $\text{Tl}$  fails to give  $\text{TlBi}$  thiocyanates. Even an  $\text{EtOH}$  soln. of  $\text{K}_2\text{Bi}(\text{CNS})_3$  treated with  $\text{TlOAc}$  gave an orange-yellow ppt. contg.  $\text{K}$ ,  $\text{Tl}$  and  $\text{Bi}(\text{CNS})_3$  but which was not a compd. When 1 and 2 equivs., resp., of  $\text{TlOAc}$  were added to 2 solns. of  $\text{K}_2\text{Bi}(\text{CNS})_3$  orange-yellow ppts. having the compn.  $\text{K}_4\text{TlBi}(\text{CNS})_8$  and  $\text{K}_7\text{Tl}_2\text{Bi}(\text{CNS})_{15}$  were obtained. All attempts to substitute all the  $\text{K}$  with  $\text{Tl}$  failed to give the desired product. E. J. WITZEMANN

**Mixed-crystal formation in ternary systems containing water, ammonium chloride,**

and ferrous, cobaltous, or nickel chloride. F. W. J. CLENDINNN. *J. Chem. Soc.* 121 801-5(1922); cf. *C. A.* 15, 3952.—As temps. above that at which hydrates higher than the dihydrate appear, 60° was chosen for the Co and 70° for the Fe and Ni systems. It was found, however, that  $\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$  is still stable at 70° but obscures only a small portion of the mixed-cryst. series. The exptl. procedure was similar to that in the preceding study of the Mn system and the data are plotted by the usual triangular method. These systems are almost completely analogous to the Mn system. In the Co system at 60° the mixed-cryst. series is continuous from  $\text{NH}_4\text{Cl}$  to  $\text{CoCl}_2 \cdot 2\text{H}_2\text{O}$ . A part of this system is metastable where the stable state is that of a series of solns. in equil. with a mixed cryst. series of very limited range, of compn. close to  $2\text{NH}_4\text{Cl} \cdot \text{CoCl}_2 \cdot 2\text{H}_2\text{O}$ .

A. R. M.

New hydrate of uranyl nitrate. F. E. E. GERMANN. *J. Am. Chem. Soc.* 44, 1466-9(1922).—By methods of thermal analysis  $\text{UO}_2(\text{NO}_3)_2 \cdot 24\text{H}_2\text{O}$  was found to be capable of existence below -20°, forming spontaneously at about -35°. The compn. was detd. from both cooling and heating curves in close agreement. An explanation of the anomalous group of spectra observed by Howes (*C. A.* 9, 2734) is given as due to too rapid cooling. The numerous spectra observed can be explained by assuming the pure spectrum of the hexahydrate, of the icositetrahydrate and of various mixts. of the two depending on concn., rate of cooling, etc.

A. R. MIDDLETON

Extraction and purification of scandium from the thortveitite of Madagascar. P. URBAIN AND G. URBAIN. *Compt. rend.* 174, 1310-3(1922).—Thortveitite contains 42%  $\text{Sc}_2\text{O}_3$ , which readily combines with fused soda and the  $\text{SiO}_2$  can be extd. from the product by  $\text{H}_2\text{O}$ . The insol. part is dissolved in the smallest possible amt. of  $\text{H}_2\text{SO}_4$  and the soln. of sulfates is treated with an excess of  $\text{HF}$ , which ppts. the Sc and other rare earths as gelatinous fluorides. The washing of these fluorides in large quantities is difficult and incomplete. The fluorides are decompd. by an excess of  $\text{H}_2\text{SO}_4$  in such a way that when taken up with  $\text{H}_2\text{O}$  the concd. acid liquid contains a large cryst. ppt. of acid Sc sulfate. As the ratio of other rare elements to Sc in this thortveitite was less than 1 to 100, purification was made by formation of the double sulfate of K and Sc. The crude sulfates were changed to hydroxides by  $\text{NH}_4\text{OH}$ , then to nitrates and evapd. on the water bath to remove the excess of acid. An excess of powdered  $\text{K}_2\text{SO}_4$  was then added to the concd. nitrates and the mixt. allowed to stand several days for as complete pptn. as possible. After filtration the ppt. was washed rapidly with a satd. soln. of  $\text{K}_2\text{SO}_4$  and the washings and mother liquor changed to hydroxides and nitrates and worked again. The pptn. of Sc by  $\text{NH}_4\text{OH}$  is never complete but  $(\text{NH}_4)_2\text{HPO}_4$  in the absence of  $(\text{NH}_4)_2\text{CO}_3$  insures complete pptn.  $(\text{NH}_4)_2\text{CO}_3$  reacts with all Sc ppts. to form sol.  $\text{NH}_4$  scandocarbonate; this on heating ppts. Sc hydroxycarbonate, which is easily washed. The other rare elements of the Sc group, which are in the mother liquors with traces of Sc, are pptd. as double K sulfates, transformed to hydroxides and treated with a moderate excess of acetylacetone, forming cryst. acetylacetonates; from these the Sc compd. is removed by  $\text{CHCl}_3$ , leaving \*Yt. Of the various acetylacetonates present the Sc compd. alone is volatile and may be sepd. by sublimation in a vacuum at about 200°.

L. W. RIGGS

The oxidation of ferrous salts by potassium ferricyanide. M. HANNIK. *Chem. Weekblad* 18, 615-6(1921).—The expts. were made with solns. contg. 0.007163 g.-mol. of reagent per l. in presence of concd.  $\text{NH}_4\text{CNS}$  solns.; the equil. examd. was, therefore,  $\text{Fe}(\text{CNS})_2 + (\text{CNS})' + \text{Fe}'''(\text{CN})_6 \rightleftharpoons \text{Fe}(\text{CNS})_3 + [\text{Fe}(\text{CN})_6]'''$ . The  $\text{Fe}(\text{CNS})_2$  formed or remaining in the soln. (the equil. position was detd. from both end-systems) was detd. colorimetrically. The oxidation of the ferrous salt was almost quant., completely so in presence of excess of either reagent (ferrous salt or ferricyanide). The reverse reaction proceeds to only a small extent even in the presence of excess of ferroc-

anide. In the ordinary prepn. of Turnbull's blue, the equil. is affected by the action of the ferrocyanide formed on the ferrous salt present.

J. C. S.

**The behavior of amorphous carbon and sulfur when heated. The sulfides of carbon.** II. J. P. WIBAUT. *Rec. trav. chim.* **41**, 153-71(1922); cf. *C. A.* **16**, 1528.—In a previous paper W. and Stofiel (*C. A.* **13**, 2586) showed that the S compds. of coal and coke are largely due to C compds. of S which do not decompose even at 1000°. Expts. showed that such compds. of C and S are obtained even on heating free S with carboniferous material (*C. A.* **13**, 2509). For similar results see also Parr and Powell (*C. A.* **14**, 3145; **15**, 306; 742). Earlier expts. of Berzelius and of Mixter (*Am. J. Sci.* [3] **45**, 373(1893)) are reviewed in detail. Stock and Praetorius (*C. A.* **7**, 2525) observed the polymerization of  $C_2S_2$  but definite compds. other than  $CS_2$  and  $C_2S_4$  are not known. The expts. here described were carried out in elec. furnaces heated with nichrome wire in porcelain tubes placed parallel to the axis of the furnace. The temp. was detd. with a thermocouple. With sugar C purified by heating in Cl a product was obtained containing 2.86 % S on heating 10 g. with 4 g. S to 89°, which fell to 1.43% on heating at 800° and 1 mm. pressure. With sugar C purified by heating *in vacuo* a product contg. 1.98% S which was not diminished by heating to 1000° at 1.0 mm. was obtained. The S in this product is oxidized with difficulty by oxidizing agents.  $H_2$  transforms it quant. into  $H_2S$  at 800°. Wood charcoal (ash 0.36%) gave a product with 3.55% S, which by heating at 1000° and 0.5 mm. is reduced to 2.65%. The S in this product contg. 4.49% S was diminished to 3.70% by heating it to 1000° at 0.5 mm. By extn. with toluene the S content of the product was diminished somewhat. The S of this product is transformed into  $H_2S$  by the action of  $H_2$  at 800°. In these products the S is bound to C by chem. forces. It is not possible to conclude from these expts. whether 1 or several compds. of definite compn. are formed. The products are probably mixts. of unchanged amorphous C and a C compd. of S which is only slightly volatile at 1000°. The behavior of the last 2 products suggests that 2 kinds of phenomena are involved: (1) an absorption in the sense of a reversible phenomenon where the substance is condensed on an absorbant without undergoing any change in the chem. properties; (2) a chem. combination. Conclusion: These products are quite analogous to coke at least so far as their S content is concerned. In coal the S present in pyrites is liberated in coking and combines with C in the same way as in these expts.

E. J. WITZEMANN

## 7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Louis Lucien de Koninck. M. HUYBRECHTS. *Bull. soc. chim. Belg.* **31**, 7-10 (1922).—An obituary.

WM. STERICKER

Charles Blas. R. V. M. *Bull. soc. chim. Belg.* **30**, 88-9(1921).—An obituary.

WM. STERICKER

**Comparative tests of methods used in alloy analysis. III. Determination of phosphorus in cast iron.** F. GRAZIANI AND L. LOSANA. *Giorn. chim. ind. applicata* **4**, 94-9, 148-53(1922); cf. *C. A.* **16**, 1199.—All of the well known methods for detg. P in cast Fe were studied critically and the conclusion is drawn that Blair's *basic acetate method* is as accurate as any, although too long for routine work. The method depending upon pptn. as phosphomolybdate and detn. of the Mo as  $PbMoO_4$  was found to be useful but good results were also obtained by weighing  $P_2O_5.24MoO_3$  as recommended by Meinicke, by weighing  $(NH_4)_3PO_4.12MoO_3$  as proposed by Finkencr and others, by the alkalimetric titration of phosphomolybdate and by the colorimetric method of Namias (for samples with less than 0.25% P).

R. S. POSMONTIER

**Iodometric analysis of the sulfides of arsenic and antimony.** FERDINAND NIKOLAI. *Z. anal. Chem.* 61, 257-72(1922).—The sulfides of As and of Sb dissolve in KOH or NaOH soln. and, if the soln. thus obtained is run into an excess of  $I_2$  in dil. AcOH, 5 atoms of I are reduced to  $I^-$  for each atom of As or Sb originally present. It makes no difference whether the As or Sb is trivalent or quinquevalent at the start for, although in one case As or Sb is oxidized, in the other case there is additional  $S^{--}$  to be oxidized. In practice, however, it is difficult to get a pure ppt. of  $As_2S_3$  or of  $Sb_2S_3$  without any admixed S which will form  $S^{--}$  on treatment with KOH soln. and cause too much  $I_2$  to enter into reaction. It is advisable, therefore, to reduce the As or Sb before pptg. with  $H_2S$ . When a soln. of alkali arsenite and thioarsenite is titrated there is usually some oxidation by the dissolved  $O_2$  in the solns. and sometimes as much as 1% too little  $I_2$  is required in the iodometric titration. This difficulty may be overcome by adding 10 cc. of 3% gelatin soln. to the alk. soln. used to dissolve the sulfides. The gelatin itself is likely to adsorb  $O_2$  so that its soln. should be boiled for about an hr. before using. The action is that of a protective colloid; atm. oxidation of the sulfide soln. is retarded but iodometric oxidation is not stopped. In the analysis of ores or alloys, the As or Sb should be reduced to the trivalent condition before pptg. with  $H_2S$  and the ppt. of  $As_2S_3$  or of  $Sb_2S_3$  washed with 5% NaCl soln. Then pierce the filter and wash the ppt. back into the pptn. flask. Dissolve in NaOH soln. contg. gelatin and pour the soln. slowly into the AcOH soln. of KI. Finally titrate the excess KI with standard  $Na_2S_2O_4$  soln. W. T. HALL

**Determination of available chlorine in hypochlorites.** J. ROYER. *Ann. f.uls.* 15, 146-8(1922).—A revision of the Pontius method which is based upon the reactions,  $3OCl^- + 6HCO_3^- + I^- \longrightarrow IO_3^- + 3CO_3^{--} + 3Cl^- + 3H_2O + 3CO_2$  and  $IO_3^- + 5I^- + 3CO_3^{--} \longrightarrow 3CO_3^{--} + 3I_2$ . A. P.-C.

**A simple and exact method for the quantitative determination of acetaldehyde in the presence of acetone.** W. STEPP AND R. FRICKE. *Z. physiol. Chem.* 116, 293-301 (1921).—To the AcH soln. add an excess of 0.1 N  $AgNO_3$ , the same quantity of 0.1 N NaOH and sufficient  $NH_4OH$  to dissolve the  $Ag_2O$ . Allow the mixt. to stand 5-6 hrs. in a stoppered flask at room temp. Heat 2-3 min. under a reflux condenser, cool and, after adding a few drops of concd.  $NH_4OH$ , filter through asbestos and wash with dil.  $NH_4$ . To the filtrate add an excess of nitrite-free  $HNO_3$  or  $H_2SO_4$  and several cc. of 10% Fe alum. Titrate with 0.1 N  $NH_4CNS$ ; 1 cc. of 0.1 N  $AgNO_3$  corresponds to 2.2 mg. AcH. In obtaining the distillate containing the AcH and  $Me_2CO$ , care must be taken to prevent the loss of AcH by reason of its low b. p. To det.  $Me_2CO$  in the distillate, first destroy the AcH by boiling for 3-5 min. with Fehling soln., distil the  $Me_2CO$  and estimate the  $Me_2CO$  in the distillate by the method of Messinger and Huppert. A procedure is described for detg. AcH and  $Me_2CO$  in the same sample but at the expense of considerable accuracy. R. L. STEHLÉ

Behavior of platinum on strong heating (BALAREFF) 2. The so-called di-[9,10-mono-hydroxyphenanthrolyl]amine proposed as a reagent for nitric acid and phenanthroxazine (FOREST) 10. Columbite from Orust (analysis of) (ALMSTROEM) 8. Double halides of bismuth and thallium (determination of bismuth) (CANNERI, PERINA) 6.

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND WALTER F. HUNT

**The preservation of mineral specimens.** A. L. PARSONS. *Am. Mineral.* 7, 59-63 (1922).—Many minerals alter under museum conditions. Laumontite must be kept



moist, deliquescent salts dry. High and low temps. must also be avoided. Light affects most minerals, some seriously (e. g., realgar, Ag compds.) and such should not be openly exhibited, but kept under cover. Lists are given of minerals which alter through loss of  $H_2O$  (17), exposure to light (16), absorption of  $H_2O$  (25), exposure to Ra (2), oxidation (4), tarnish, in part by oxidation (21), rapid change in temp. (1), volatilization (2), and melting at moderate temps. (1). E. T. W.

**Rapid tests for copper in pyrite and iron minerals.** A. BRALY. *Bull. soc. franç. minéral.* **44**, 119-21 (1921).—A content of Cu as low as 0.7% is revealed by the red coloration of a  $NaPO_3$  bead, heated in the reducing flame with the addition of  $SnO$ ; smaller amts. by the characteristic blue flame color, obtained by roasting the powdered mineral on a mica support, adding  $HCl$ , and evapg. EDW. F. HOLDEN

**A new method of using the physical characteristics of minerals for their identification.** C. J. GRAY. *Trans. Geol. Soc. S. Africa* **23**, 114-7 (1921).—A scheme of identifying minerals by means of a series of perforated sheets is described. Each of these, when placed upon an index sheet, cuts out those minerals which do not have the particular phys. character with regard to which the sheet was perforated. An index list of minerals, a keysheet, and 66 perforated sheets are applied to the identification of 361 minerals. S. G. GORDON

**Some mineral occurrences in the Namib desert.** P. A. WAGNER. *Trans. Geol. Soc. S. Africa* **24**, 71-97 (1922).—Occurrences of itabirite, cordierite, garnet, beryl, quartz, feldspar, tourmaline, pyrite, wolframite, and phlogopite are described, with analyses and geologic data. S. G. G.

**Catalog of the Stockholm Högskola collection of new or insufficiently described minerals from Långban.** G. FLINK. *Geol. För. Förh.* **44**, 535-9 (1922).—In addn. to the 87 unnamed minerals from Långban recently announced (*C. A.* **15**, 3958) 52 which need identification were found during 1921. The list is given in detail with a short description of each mineral, and data as to relative abundance. *Trimerite* and *hedyphane* of hitherto unknown quality were found in the Hindenburg Mine at Långban. Two new mines have been opened—Raemsörten and Irländ. The former yields *kentrolite*, the latter fine crystals of *tilasite* and *dixenite* well suited for the detn. of the crystal angles. The Långban locality is the most prolific source of minerals known at present and probably the best ever known. W. SEGERBLUM

**Contributions to the mineralogy of the Yxsjö mines.** N. ZERNÉN. *Geol. För. Förh.* **44**, 539-43 (1921).—Z. discovered in 1921 at Yxsjö massive calcite relatively rich in light gray to reddish *plagioclase*. Dissolving the calcite left crystals, sometimes more than 2 cm. in size, usually less than 1 cm.; a description of these is given. The compn. is probably  $Ab_{55}An_{45}$  on the Becke diagram, which corresponds well with Geijer's  $Ab_{55}An_{45}$ , but not with Lindroth's  $Ab_{50}An_{50}$ — $Ab_{50}An_{50}$ . *White fluorite* is isotropic and has the same  $n$  and difficult fusibility before the blowpipe as Macomb fluorite. It melts easily, however, when mixed with gypsum or scheelite. *Siderite* has sp. gr. = 3.79, and qual. analysis showed only traces of carbonates of Mn, Ca and Mg. *Hisingerite* has earthy fracture and highly lustrous cleavage planes. It melts before the blowpipe and gives much  $H_2O$  when heated.  $HCl$  dissolves the Fe easily, leaving silicic acid, and there are no traces of Cu or Mn. W. SEGERBLUM

**Massive troilite from Del Norte Co., Calif.** A. S. EARLE. *Am. Mineral.* **7**, 77-80 (1922).—Troilite,  $FeS$ , has been found heretofore only in meteorites, but an occurrence on the earth has now been discovered. The mineral differs from pyrrhotite ( $Fe_{7.5}S_8$ ) in color and also in being non-magnetic and readily sol. in dil.  $H_2SO_4$ . Two analyses gave the ratio of Fe : S almost exactly 1 : 1. The material shows magnetite inclusions and has evidently been formed by the action on magnetite of solns. contg.  $H_2S$ . The theory of Allen, *et al.* (*C. A.* **6**, 1583), that the excess of S in pyrrhotite is in

solid soln. in the end-member, FeS, does not conform to the existing relations. The properties of pyrrhotite and troilite are too different for them to belong to the same series, and it seems improbable that a small excess of S in solid soln. could transform the one into the other. It is more likely that the end-member of the pyrrhotite series is  $\text{Fe}_3\text{S}_4$  (the magnetism indicating relationship to magnetite,  $\text{Fe}_3\text{O}_4$ ) and that the usually lower S is due to solid soln. of troilite, FeS.

E. T. W.

**Andorite-bearing silver ore from Nevada.** E. V. SHANNON. *Proc. U. S. Nat. Mus.* 60, No. 2411, 1-5(1922).—An ore from Keyser Mine, Nye Co., Nev. averaged 1000 oz. of Ag to the ton. It is mostly in the form of *andorite*, or an alteration product of andorite. The genesis of the mineral is described. The andorite has metallic luster and light lead-gray color. Its  $H. = 2.5$ , and streak dull black, rubbing brown. Hand-picked material gave on anal., after deducting  $\text{SiO}_2$ : Pb 23.35, Ag 12.09, Fe 1.55, Zn 3.56, Sb 37.64, S 22.63, sum 100.82 %; the Zn is present as sphalerite, Fe is probably extraneous, so the formula is  $\text{PbAgSb}_2\text{S}_7$ . A completely altered specimen gave: Pb 45.14, Ag 7.78, Sb 23.22, Fe 2.72, Zn 1.56 %. Rejecting Fe and Zn and calcg. as sulfides, the formula becomes  $\text{Pb}_2\text{AgSb}_2\text{S}_5$ . The gang is largely *rhodochrosite* as shown by the figures: MnO 49.49, FeO 7.68, CaO 3.13, MgO 0.93,  $\text{CO}_2$  (calcd.) 38.87 %. Such highly manganiferous carbonates are frequent as gang minerals in hydrothermal Ag veins.

L. W. RIGGS

**The existence of fluorite in the orpiment from Luceram, maritime Alps.** J. ORGEL. *Bull. soc. franç. minéral.* 44, 171(1921).—Small crystals and cleavage masses of fluorite are intimately associated with the orpiment (C. A. 13, 3115). At Chitral in n. w. India is a similar occurrence.

EDW. F. HOLDEN

**Ceruleofibrite, a new mineral.** EDW. F. HOLDEN. *Am. Mineral.* 7, 80-3(1922).—Specimens of cuprite from the Bisbee Ariz. district are found to contain a new mineral with the properties: Structure, fibrous; color, pure bright blue; streak light blue; luster silky;  $H. = 3$ ; sp. gr. = 3.54. Under the microscope is light blue with but slight pleochroism; the  $ns.$  are:  $\alpha = 1.736$ ,  $\beta = 1.737$ ,  $\gamma = 1.741$ , sign + with  $2V = 63^\circ$ . The system is orthorhombic, and approx. measurement under the microscope gave:  $a : b : c = 0.78 : 1 : 0.49$ , which is identical with that of brochantite ( $\text{CuSO}_4 \cdot 3\text{Cu}(\text{OH})_2$ ). The material dissolves readily in dil. acids, but the soln. does not reduce  $\text{Fe}^{+++}$ , so all the Cu is cupric. In the closed tube it becomes green and then black, giving up  $\text{H}_2\text{O}$  at a fairly high temp. and a yellow sublimate contg. As. It colors the flame blue. Anal. gave: CuO 73.8, Cl 7.5,  $\text{As}_2\text{O}_5$  7.5,  $\text{H}_2\text{O}$  11.7, insol. 0.3, less O = Cl 1.7, sum 99.1 %. Deducting a slight excess of Cu due to admixed cuprite, this corresponds closely to  $3\text{CuCl}_2 \cdot \text{Cu}_3\text{As}_2\text{O}_8 \cdot 18\text{Cu}(\text{OH})_2$ . It is thus somewhat analogous to the isogonic brochantite.

E. T. W.

**Becquerelite, a new radioactive mineral.** A. SCHOEP. *Compt. rend.* 174, 1240-2 (1922).—Associated with curite (C. A. 16, 1059) in the pitchblende from Kasolo Mine, Katanga, Belgian Congo, was found a cryst. mineral of brownish yellow color and resinous luster. These crystals are rhombic, optically— and possess 2 perfect cleavages;  $\alpha$  is about 1.756, and the birefringence 0.015-0.019. The av. of 2 closely agreeing analyses of a very pure portion was:  $\text{H}_2\text{O}$  5.82,  $\text{UO}_2$  86.51,  $\text{Fe}_2\text{O}_3$  0.54, PbO 5.25,  $\text{SiO}_2$  0.83,  $\text{SO}_2$  1.01, sum 99.96%. The analyses were made on the powdered mineral dried at  $100^\circ$  to const. wt., in the course of which the air-dried mineral lost 4.21% of water. Deducting the PbO and  $\text{SO}_2$  corresponding to anglesite and the  $\text{SiO}_2$  and  $\text{Fe}_2\text{O}_3$  as impurities, the air-dried mineral contained  $\text{H}_2\text{O}$  10.03 and  $\text{UO}_2$  83.01, corresponding to the formula  $\text{UO}_2 \cdot 2\text{H}_2\text{O}$ . Its radioactivity is about the same as that of pitchblende. The name *becquerelite* is proposed in honor of Henri Becquerel.

L. W. RIGGS

**Notes on sand calcite from South Dakota.** H. R. WANLESS. *Am. Mineral.* 7, 83-6(1922).—The locality and occurrence are described. Anal. shows the crystals to

contain calcite 36.95-37.00, mud and silt 0.2 %, and the balance sand. The latter contained besides quartz over 15 other minerals. The methods of anal. and identification used are given. The sand represents a wind-blown dune deposit, and the calcite was probably formed by spring deposition at some depth. E. T. W.

**Sodium carbonate minerals of the Mogadi Lakes, British East Africa.** P. WALTHER. *Am. Mineral.* 7, 86-8(1922).—The Mogadi Lake is nearly filled by a coarse cryst. deposit of a Na carbonate shown by analysis to be nearly pure trona ( $\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3 \cdot 2\text{H}_2\text{O}$ ). A red color shown by some layers is probably due to the dye from flamingo feathers. Much  $\text{CO}_2$  comes up through cracks in the vicinity, and it is thought that a Na-silicate rock has been thereby decompd. Further south in the Little Mogadi the  $\text{CO}_2$  is so abundant that it has changed the trona into  $\text{NaHCO}_3$ , which has not heretofore been observed in nature. Specimens preserved have been found by optical examn. to be now entirely converted into trona. E. T. W.

**A new occurrence of stichtite from the Barberton District.** A. L. HALL. *Trans. Geol. S. Africa* 24, 182-97(1922).—Stichtite from farm Joubertsdal, 3 miles from Kaap-sche Hoop, is described, with analyses. S. G. GORDON

**Two corrections to mineral data.** N. L. BOWEN. *Am. Mineral.* 7, 64-6(1922).—The material which has been called "rivaite" is found to be non-homogeneous, and to consist of wollastonite ( $\text{CaSiO}_3$ ) embedded in blue glass. "Reaumurite" is essentially the same, with some Na replacing Ca. Synthetic material of the compn.  $(\text{Na}_2\text{Ca})\text{Si}_2\text{O}_6$ , which has been ascribed to "rivaite," has different properties. *Monticellite* is described in textbooks to have a small axial angle, but really has a large one; in fact, when FeO replaces CaO to the extent of about 2%,  $2V = 90^\circ$ . The unidentified mineral "A" of Larsen and Foshaag (*C. A.* 16, 40) is accordingly monticellite. E. T. W.

**The albite from Rischuna in morphologic relationship.** BERTA KREBS. *Z. Krist.* 56, 386-407(1921).—Since the axial angles of the plagioclases are closely related to the compn., morphologic studies must be made on chemically well-defined material. Crystals from the Alp Rischuna (Switzerland) were studied. The sp. gr. measured on a number of specimens by the suspension method averages  $2.623 \pm 0.001$ . The extinction angles on  $p = 3.5$ , on  $M$   $19.3^\circ$ . Anal. (by Salbohm) showed only 0.09 % CaO, and therefore but 3.4 mol. % of anorthite. Elaborate crystallographic measurements were then made, the probable angles being arrived at by the heaping-up method. The results are:  $a : b : c = 0.6352 : 1 : 0.5584$ ;  $\alpha = 94^\circ 14.6'$ ,  $\beta = 116^\circ 35.7'$  and  $\gamma = 87^\circ 46.0'$ . These data must be essentially those for pure albite. E. T. W.

**New chemical analyses of the olivine of lithosiderites.** P. CHIRVINSKI. *Bull. soc. franç. minéral.* 44, 170(1921).—The analyses represent olivine from: (1) Ahumada, (2) Finmarken, (3) Mont Dyrning, N. S. W. and (4) Molong, N. S. W.:

	1.	2.	3.	4.
$\text{SiO}_2$	38.43	39.32	40.52	39.32
$\text{FeO}$	14.93	26.61 <sup>a</sup>	13.13	13.13
$\text{MnO}$	trace	—	—	trace
$\text{MgO}$	46.27	44.07	47.30	47.70
$\text{CaO}$	0.40	—	trace	trace
sum	100.03	100.00	100.95	100.15

<sup>a</sup>Probably 16.61.

EDW. F. HOLDEN

**The occurrences of amianthus in the region of Orezza, Corsica.** J. ORCEL. *Bull. soc. franç. minéral.* 44, 108-17(1921).—Asbestos is found surrounding serpentine masses in schist. Spectral anal. of several specimens showed the presence of Si, Ca, Sr, Mg, Fe, K, Na, Mn, Cr, Ni and Co. EDW. F. HOLDEN

**The asbestos occurrences near Kaapsche Hoop in the Barberton District.** A. L. HALL. *Trans. Geol. Soc. S. Africa* **24**, 168-81 (1922).—Veins of chrysotile occur in a sill of serpentine, following a horizon generally corresponding to the contact between two varieties of serpentinous rocks. The origin of the veins is discussed. Analyses of the chrysotile and serpentine are given. S. G. GORDON

**Soddyite, a new radioactive mineral.** A. SCHÖPF. *Compt. rend.* **174**, 1066-7 (1922).—The curite from Kasolo is often intimately associated with a yellow mineral with  $H. = 3-4$  and  $1.622 < \beta < 1.654 < \gamma < 1.705$ ;  $D. = 4.627$  at  $17^\circ$ . In the closed tube it loses  $H_2O$  and  $O$ , turning black, and failing to regain its original color on cooling. The mineral is sol. in acids with the sepn. of gelatinous  $SiO_2$ , and the soln. is colored yellow by  $U$ . Analyses gave an av. of:  $SiO_2$  7.83,  $UO_3$  85.33,  $H_2O$  6.23%, corresponding to  $12 UO_3 \cdot 5SiO_2 \cdot 14H_2O$  [or perhaps simply  $(UO_3)_2 \cdot SiO_2 \cdot 3H_2O$ . ABSTRACTOR]. The name *soddyite* is proposed in honor of Frederic Soddy. L. W. RIGGS

**Columbite from Orust.** G. K. ALMSTROM. *Geol. För. Förh.* **44**, 482-4 (1922).—In Sweden columbite is found only at Orust and up to now has never been analyzed. Its sp. gr. = 6.20. A qual. detn. on 3 g. showed that  $Sn$ ,  $W$ ,  $U$ ,  $Zr$ ,  $Th$ , and  $Ce$  and  $Gd$  earths are not noticeably present. Decompn. of 2.3 g. with  $K_2S_2O_7$  and soln. of the melt in cold  $H_2O$  dissolved not only the  $Ti$  completely but much of the other metal acids. Heating the melt with water for several hrs. rendered the  $Ti$  insol. Subsequent treatment with  $H_2O$  and  $H_2SO_4$  dissolved part of the acids. The  $Ch$  and  $Ta$  acids made by  $K_2S_2O_7$  are not as sol. in the above reagents as when pptd., but 40%  $HF$  soln. dissolves them easily. Addn. of  $KF$  and concn. of the soln. produced needle crystals of  $K$  fluotantalate. Further addn. of  $KF$  and concn. produced more crystals, the  $Ch$  compd. sepg. last. The  $Ta$  was weighed as  $Ta_2O_5$  free from  $Ti$ . The  $Ch_2O_3$  and  $TiO_2$  were weighed together, fused with  $KOH$ , dissolved in  $H_2O_2$  and  $H_2SO_4$  and tested colorimetrically for  $Ti$ .  $SiO_2$  was detd. in a sep. portion. The av. of several detns. gave:  $SiO_2$  0.45,  $Ta_2O_5$  42.95,  $Ch_2O_3$  37.49,  $TiO_2$  0.66,  $FeO$  2.50,  $MnO$  13.02,  $Al_2O_3$  0.53,  $CaO$  1.55,  $MgO$  0.10,  $K_2O$  0.07,  $Na_2O$  0.14, loss on ignition 0.40, sum 99.86%. The  $SiO_2$  and some of the other components may have come from impurities, but the mineral stands between tantalite and columbite in compn. W. SEGERBLOM

**A new occurrence of vanadinite in the Marico district, Transvaal.** P. A. WAGNER. *Trans. Geol. Soc. S. Africa* **23**, 59-63 (1921).—Vanadinite is the principal ore mineral in a deposit 14 miles east of Ottoshoop. Galenite and cerussite are subordinate. Crystals are tabular on  $(0001)$ , and show also  $(10\bar{1}0)$ , and  $(10\bar{1}1)$ . Anal. by Marchand gave:  $PbO$  78.60,  $V_2O_5$  19.23,  $Cl$  2.49, insol. 0.13, less  $O = Cl$  0.56, sum 99.89%; sp. gr. = 6.46. Geologic details are given. S. G. GORDON

**Adamite.** H. UNGERMACH. *Bull. soc. franç. minéral.* **44**, 122-7 (1921).—Measurements on crystals from Laurium showed the presence of 20 forms, 11 of them new;  $(102)$ ,  $(203)$ ,  $(250)$ ,  $(140)$ ,  $(053)$ ,  $(212)$ ,  $(311)$ ,  $(412)$ ,  $(421)$ ,  $(121)$ ,  $(231)$ ; the new axial ratio is:  $a : b : c = 0.9770 : 1 : 0.7124$ . EDW. F. HOLDEN

**The calcium-uranium-mica (autunite).** F. HENRICH. *Ber.* **55B**, 1212-5 (1922).—Autunite from Steinbruch Fuchsbau in the Fichtelgebirge gave:  $UO_3$  59.71,  $CaO$  5.92,  $P_2O_5$  14.30, loss on ign. 18.17, insol. 1.50, sum 99.60%. That from the province Beira Alta, Portugal, gave:  $UO_3$  60.72,  $CaO$  6.04,  $P_2O_5$  14.55, loss on ign. 18.27, insol. 0.53, sum 100.11%. The first contained  $Ra : U = 2.8 \times 10^{-7}$ , 87% of the theoretical value for equil. between the elements, and the highest proportion yet found in this mineral; the Portuguese mineral gave  $Ra : U = 1.25 \times 10^{-7}$ , 38% of theory. E. F. H.

**Contributions on the chemical constitution and genesis of the natural iron sulfates.** X. R. SCHARIZER. *Z. Krist.* **56**, 353-85 (1921); cf. *C. A.* **8**, 3171.—*Rhombochase*,  $(FeOH)(HSO_4)_2$  is shown to be monoclinic, with  $a : b : c = 0.4633 : 1 : 0.7416$ ;  $\beta = 89^\circ 6'$ . Two  $ns.$  were detd. to be  $\beta = 1.551$ ,  $\gamma = 1.650$ , and as it is optically—, its bire-

fringence is extremely strong. Contrary to the experience of Wirth and Bakke (*C. A.* 8, 2853) it is found that this compd. does give off  $H_2O$  on long standing over concd.  $H_2SO_4$ . On heating in dry air both  $H_2O$  and  $H_2SO_4$  are given off, the compd.  $Fe_3S_4O_{15} + 3H_2O$  passing into  $Fe_3S_4O_{14} + H_2O$  and then into  $Fe_3S_4O_{12}$ ; 3  $Fe'''$  tetrasulfates thus exist. When various  $Fe'''$  sulfates are placed in funnels in a moist atm., they absorb so much  $H_2O$  as to dissolve, and the liquid can be collected and analyzed. Rhomboclase, coquimbite ( $Fe_3S_4O_{12} + 9 H_2O$ ) and copiapite ( $Fe_3S_4O_{21} + 18 H_2O$ ) were tried separately and then together. The resulting liquids seemed to have definite comps., the compds. taking up 50-60%  $H_2O$ . For the study of the hydrolysis of  $Fe'''$  sulfates, acetone is a suitable medium, as it dissolves out the dissociated  $SO_4$ . Anal. of products thus obtained shows that the end product toward which the process tends is  $Fe_3S_4O_8$ , which with 7  $H_2O$  forms the mineral amaranthite. The genesis of this series of sulfate minerals can now be worked out by definite reactions. On concn. of a dil. soln. more and more  $H_2SO_4$  unites with the  $Fe'''$ , forming the 3 minerals successively or together. In mixtures of the 3, rhomboclase becomes liquid in a moist atm. first, but without reacting with the others. Later when coquimbite liquefies, reactions occur. The compd.  $(FeOH)_2(HSO_4)_4$  is studied in detail. In the course of crystg. some  $FeSO_4$  from a soln. containing excess  $H_2SO_4$  some of the  $Fe$  oxidized and pseudo-rhombic crystals of this compd. sepd. out. Their sp. gr. = 2.549. They proved on anal. to contain considerable  $Fe''$  sulfates as impurities. Better crystals were obtained when rhomboclase was dissolved in  $H_2O$  and at least 66.5% of  $H_2SO_4$  added. They proved to be monoclinic, but twinned so as to appear trigonal or hexagonal. Analysis of these showed the compn. corresponding to the formula. In the air they absorb  $H_2O$  and pass into rhomboclase.

E. T. W.

**Meteorite iron from Odessa, Ector County, Texas.** GEO. P. MERRILL. *Am. J. Sci.* 3, 335-7 (1922).—The specimen as received weighed 72.6 g. but was cut from a larger mass. Its structure is octahedral and coarse cryst. The entire mass is composed mainly of broad kamacite plates and the included schreibersite. A slice freed from crust and oxidation products and containing no visible troilite was analyzed by E. V. Shannon with the results: Fe 90.69, Ni 7.25, Co 0.74, Cu 0.02, C 0.35, P 0.23, S 0.03, sum 99.31%. A trace of Cr was present, but neither Pt nor Mn.

L. W. RIGGS

**Microscopic and chemical study of the meteorite of Tomakovka, Govt. of Ekaterinoslav, Russia.** P. CHIRVINSKII. *Bull. soc. franç. minéral.* 44, 155-62 (1921).—This meteorite, wt. 250 g., fell Jan. 7, 1905. It contains pyroxene and olivine (89%), oligoclase, Ni-Fe (2.5%), troilite (7.5%), and chromite. Its sp. gr. = 3.53. This is a chondrite of Prior's group 4. Analyses of the sol. and insol. parts, and the part not attracted by the magnet, are given.

EDW. F. HOLDEN

**A study of the meteorite of Okhansk.** P. CHIRVINSKII. *Bull. soc. franç. minéral.* 44, 162-9 (1921).—A portion of this meteorite, which fell in 1887, had sp. gr. = 3.756. It is composed of bronzite, enstatite, diopside, olivine, (silicates 75%), Ni-Fe (21%), troilite (4%), chromite and schreibersite. It is a brecciated chondrite. Nine analyses are given.

EDW. F. HOLDEN

**A plea for economic mineralogy.** OLIVER BOWLES. *Am. Mineral.* 7, 67-9 (1922).—It is urged that in teaching mineralogy the economic side be emphasized, and specimens of commercial rather than museum quality be used. The chem. classifications of the textbooks might well be replaced by groupings of minerals of similar economic significance.

E. T. W.

**Physiography and glacial geology of Gaspé Peninsula, Quebec.** A. P. COLEMAN. *Can. Dept. Mines Geol. Survey Bull.* 34, 50 pp. (1922).—Coal, petroleum, asbestos, Au, Cu, and Cr have been reported from this area. Recently extensive high-grade Zn and Pb ores have been mined in Lemieux township, within 10 miles of a 60 ft. waterfall, and the outlook is encouraging.

L. W. RIGGS

**Geology and mineral resources of Rice Lake and Oiseau River areas, Manitoba.** H. C. COOK. *Can. Dept. Mines Geol. Survey No. 1947*, 36 pp. (1922).—The principal ore mineral in both districts is pyrrhotite contg. more or less pentlandite and chalcopyrite. Ilmenite and magnetite are also present in large amts. Much more work must be done in order to det. the extent and com. importance of these deposits. Au deposits of the Rice Lake district are vein fillings and replacements in belts of schist formed by earlier faulting. Although rich samples occur in some shear zones the prospects are not encouraging. L. W. RIGGS

**The ores of the redeemed territories. II.** GASTANO CASTELLI. *Rass. min.* 56, 78-82 (1922); cf. C. A. 16, 2284.—In Alto Adige the chief ores are chalcopyrite, pyrite, and mixed ores contg. also sphalerite and galenite. In Venezia Giulia are cinnabar, coal, lignite, marble, barite, yellow ochre and mixed sulfide ores contg. Zn and Pb. These are treated in detail, geographically and geologically. C. C. DAVIS

**Note on the nature and origin of the Crocodile River iron deposits.** P. A. WAGNER. *Trans. Geol. Soc. S. Africa* 23, 118-29 (1921).—The hematite deposits described are situated in the Rustenburg district, Transvaal, and occur in irregularly banded rocks composed of quartz and hematite, overlying a dolomite. A persistent bed of chert conglomerate overlies the ironstones. It is believed that the deposits owe their origin to secondary enrichment, whereby original siliceous layers of banded ironstones have been replaced by Fe oxide, giving rise to solid bodies of ore made up of alternate layers of primary and secondary hematite; thus being in mode of origin identical with some of the Lake Superior deposits. S. G. GORDON

**Behavior of gold ores at depth.** D. A. STUMPF AND M. BRÜLL. *Edel-Erden u.-Erze* 3, 38-9 (1922).—At Brandholz in Fichtelgebirge a vein of pyrite, 100 m. below ground-water, has a good primary Au content. This mine is in Cambrian or Pre-Cambrian rocks, which usually carry workable Au veins to great depths. EDW. F. HOLDEN

**Preliminary note on the occurrences of tin and silver in Bolivia.** R. KOSLOWSKI. *Bull. soc. franç. minéral.* 44, 128-52 (1921).—Sn and Ag occur in veins in acid, igneous and associated metamorphic rocks, in and south of the Cordillera Real. The veins are of 3 types: (1) Sn veins, of pneumatolytic origin; the cassiterite is compact, tourmaline abundant, topaz, fluorite, and lepidolite rare. The igneous rock is low in alkalis, and contact metamorphism is less pronounced than in most such occurrences. (2) Sn-Ag veins, of cassiterite, and complex sulfides of Sn, Pb, Cu, Sb, and Ag. These veins were deposited principally from alk. thermal waters at a lower temp. than the Sn veins. Sericitization of the rock is the rule. (3) Ag veins, of sulfides, with barite, and poor in tourmaline; they are characterized by sericitization or kaolinization of the country rock. Thermal waters caused their formation, and the igneous rock was probably less acid than with the Sn veins. EDW. F. HOLDEN

**The nature of the tin deposits near Kuils River, Stellenbosch District, and their relations to other occurrences in the neighborhood.** A. V. KRIGE. *Trans. Geol. Soc. S. Africa* 24, 53-70 (1922).—The Sn lodes occur in the marginal zone of a batholithic mass of granite intrusive in a series of shales. At the contact are successively: spotted slates; veins of granite in the slates, followed by alternating granite and slate; and granite exhibiting contact facies, and cut by veins of aplite, pegmatite, with many tourmalinized nodules and druses. The minerals of the veins include cassiterite, wolframite, löllingite tending toward arsenopyrite, chalcopyrite, molybdenite, tourmaline, apatite, and zircon. It is thought that the deposition occurred at a temp. far above 360° from ascending solns. carrying SiO<sub>2</sub>, SnO<sub>2</sub>, H<sub>2</sub>O, and mineralizers such as compounds of B, Li and other alkalis. S. G. GORDON

**Bismuth.** K. MIELEITNER. *Edel-Erden u.-Erze* 3, 61-3, 74-7 (1922).—A list

of all Bi-bearing minerals and their localities is given. Bi is usually associated with Sn, Co, Ni, Au, Ag, and Cu. The treatment, uses, and production are taken up.

EDW. F. HOLDEN

**The granite-gneisses of Southern Eyre Peninsula, South Australia, and their associated amphibolites.** C. E. TILLEY. *Quart. J. Geol. Soc.* **77**, 75-134(1921).—Granites and granite-gneisses of Pre-Cambrian age occupy a large portion of the region. The petrography of the gneisses and their satellitic pegmatites are described, including biotite, hornblende-biotite, and hornblende-granite gneisses, pyroxene-granites, and garnet-gneisses. The pegmatites are of predominantly hornblendic types. The gneissic structure is primary, arising from flow movements in a heterogeneous magma. Included within the granite-gneisses is a series of amphibolites which represent earlier rocks which have been involved and engulfed in the later acid gneisses. The metamorphism of the rocks is described in detail.

S. G. GORDON

**The rocks of a portion of Portuguese East Africa.** R. B. YOUNG. *Trans. Geol. Soc. S. Africa* **23**, 98-113(1921).—Petrographic descriptions with analyses are given of the following rocks collected on a journey about the Little Lebombo Mts.: rhyolite, obsidian, pitchstone, nepheline-syenite porphyry, vogesite, and basalt.

Š. G. G.

**The igneous complex of Leeuwfontein, Pretoria District.** S. J. SHAND. *Trans. Geol. Soc. S. Africa* **24**, 232-49(1922).—This complex contains soda-trachyte, akterite, umptekite, foyaite, with dike rocks including syenite-porphyrries, dike foyaite, bostonite, and tinguaita. Petrographic details are given, with analyses, and the field relations described.

S. G. GORDON

**The nepheline rocks of Sekukuniland.** S. J. SHAND. *Trans. Geol. Soc. S. Africa* **24**, 111-49(1922).—The nepheline-syenite body of Sekukuniland forms an intrusive stock in the red granite of the Bushveld laccolith, and ranges from extremely leucocratic to rather melanocratic varieties. A table is given in which the rocks are classified into: the foyaite range, the ijolite range, and the canadite range, each of which is further sep'd. into divisions based upon the relative % of light to dark minerals. Petrographic details, with analyses, are given. Included within the intrusive is a great block of white cryst. marble, which locally contains crocidolite and apatite; S. discusses: the source of the inclusion; the form of the intrusive; the reaction of the foyaite and limestone, and the mineralization of the limestone.

S. G. GORDON

**The rocks and contact minerals of Mansjö Mountain.** H. VON ECKERMANN. *Geol. För. Förh.* **44**, 203-410(1922); cf. *C. A.* **16**, 889.—A small area comprizing the crest of Mansjö Mountain, Sweden, has been fully investigated. The early Fe mines were economically worthless as the Fe "ore" was mainly eulysite rock. Detailed tables give 48 new analyses of Mansjö minerals. The mountain consists of a synclinally folded, older series of beds, embracing limestone, pyroxene-gneiss and paragneiss, the latter intruded by amphibolite before the folding of the syncline, as shown by the behavior of the reaction zones, by analyses, and by the analogy with the corresponding Finland rocks. A Mg-periodotite (harzburgite) and an Fe-periodotite (eulysite) intruded the strata after the folding. To explain the presence of pyroxene rock bordering the harzburgite towards the acidic sedimentary rocks, E. assumes a hydatogenous enrichment towards the contacts, resulting in a rapid crystn. The crystn. of the harzburgite agrees with the MgO-SiO<sub>2</sub> melting diagram. Two new minerals have been found, *mansjoeite* and *sky-blue apatite*. Into the compn. of mansjoeite (fluoridiopside) mols. of diopside and the humite group enter as a double salt or solid soln. It occurs as granular cryst. grains, grayish green, but colorless in thin sections. It is monoclinic with axial plane (010), and prismatic cleavage. The grains often carry minute cavities probably filled with gas. Its sp. gr. = 3.236. The axial angle is higher and the extinction  $c : \gamma$  lower than for diopside; the  $n$  agrees well, but the birefringence is lower:  $2V_D = 58^\circ$

20'; Birefr. ( $\gamma - \beta$ ) = 0.0219; ( $\beta - \alpha$ ) = 0.0069; ( $\gamma - \alpha$ ) = 0.0288;  $\beta$  = 1.6820;  $\epsilon$  :  $\gamma$  = 35° 0'. The F content is 3 times that of scheffelite: SiO<sub>2</sub> 50.14, TiO<sub>2</sub> none, Al<sub>2</sub>O<sub>3</sub> 0.95, FeO 7.45, Fe<sub>2</sub>O<sub>3</sub> 0.91, MnO 0.08, CaO 21.26, MgO 17.10, K<sub>2</sub>O 0.07, Na<sub>2</sub>O 0.24, P<sub>2</sub>O<sub>5</sub> 0.03, F 0.63, CO<sub>2</sub> 0.00, H<sub>2</sub>O 0.76, sum 99.63%, or : diopside 57.78, hedenbergite 26.25, acmite 2.36, augite 2.16, chondrodite (?) 11.45, sum 100.00%. It has been formed from hydrotogenous, halogeneous, pneumatolytic residual solns. on sudden diminution of pressure. Two kinds of apatite occur, the Cl content of the *sky-blue apatite* being more than 3 times that of the colorless. Red heat decolorizes the former. Its sp. gr. = 3.270,  $\omega$  = 1.634;  $\epsilon$  = 1.631; ( $\omega - \epsilon$ ) = 0.003. Anal. of colorless gave: Al<sub>2</sub>O<sub>3</sub> 0.58, Fe<sub>2</sub>O<sub>3</sub> 0.35, CaO 55.01, P<sub>2</sub>O<sub>5</sub> 41.96, CO<sub>2</sub> 0.41, F 3.75, Cl 0.10; loss on ign. 0.05, sum 102.21%; of blue: Al<sub>2</sub>O<sub>3</sub> 0.46, Fe<sub>2</sub>O<sub>3</sub> 0.23, CaO 54.95, P<sub>2</sub>O<sub>5</sub> 42.10, CO<sub>2</sub> 0.36, F 3.64, Cl 0.35, sum 102.09%. The varying chem. and mineralogical comps. of the pegmatite dikes during alteration were investigated analytically and microscopically they showed an essential transport of Mg and Al to the limestone by halogens. The mineral formations are shown by 6 groups of equations starting with the formation of apatite from limestone, HF and P<sub>2</sub>O<sub>5</sub>, and ending with the formation of carbonate-scapolite. The *eulysite* rocks are described in detail and a hypothetical melting diagram FeO-SiO<sub>2</sub> is drawn up. The successive alteration of eulysite into ferro-anthophyllite-skarn, grunerite-skarn and hematite-skarn is shown by field observations and microscopical detns. to be governed by definite laws, which are stated by chem. equations. E. proposes as the genesis of eulysite a hydrotogenous, halogeneous, pegmatitic residual soln. out of basic magmas. He explains the aggregate crystn. as a result of a sudden fall of pressure following intrusion into the sedimentary rocks. The phys., chem., and optical properties of 23 contact minerals of the pegmatite dikes and the limestone are given; they include besides those above described pyrite, fluorite, quartz, spinel, calcite, microcline, plagioclase, amphotelite, diopside, wollastonite, pyrrholite, pargasite, grossularite, scapolite, vesuvianite, zircon, orthite, prehnite, chondrodite, phlogopite, and titanite. The degree of pneumatolytic contact metamorphism of a limestone layer under the influence of a surrounding fluid magma may be ascribed first to the gas-absorption capacity of the limestone and adjacent sedimentary deposits, and second to the vapor pressure curve in the *P-T* diagram of the satd. magmatic soln.

W. SEGERBLOM

Problems suggested by the igneous rocks of the Jotnian and sub-Jotnian Age. P. GEIJER. *Geol. Förr. Förr.* 44, 411-3 (1922).—G. points out 2 new districts of sub-Jotnian rocks. One at Gustav, Dalarna, shows quartz-porphry dykes contg. red feldspar and quartz phenocrysts. The groundmass, less than one half of the vol. of the rock, is greenish gray, fine-grained and microgranitic, with about equal quantities of orthoclase and albitic plagioclase, and traces of chlorite, fluorite and zircon. The other district, Lake Mälaren, shows quartz-porphry pebbles contg. grayish or reddish yellow feldspar (albitic plagioclase) and fewer quartz phenocrysts, and the groundmass is brown. The igneous Jotnian rocks are compared with those of the Keweenaw of Lake Superior. Triangular diagrams on Or-Ab-An lines show the feldspar proportion of the Jotnian acid rocks and the Keweenaw acid rocks, resp. These show a close analogy between the rapakivis and the granites of Breven and Pigeon Point, thus forming a new link in the evidence favoring the development of granite by differentiation from a gabbro or diabase.

W. SEGERBLOM

Dolomitization in the carboniferous limestone of the Midlands. L. M. PARSONS. *Geol. Mag.* 59, 51-63, 104-17 (1921).—The dolomitic and dolomitic limestones of Central Derbyshire are described, with a detailed discussion of the process of dolomitization. Tables showing the variation in grain, in chem. compn., sp. gr., and in porosity are given. It is concluded that, in Derbyshire, dolomitization was wholly subsequent in the main limestone mass, having been effected by magnesian ground waters, although



the source of the Mg is not definitely known; while the dolomites north of the Leicester-shire coalfield are contemporaneous in origin. Subsequent dolomitization is capable of affecting certain beds, while others above and below may be left unaffected, hence apparent interbedding is not necessarily a proof of contemporaneous alteration. In general the greater the degree of "magnesianism," the higher the porosity. S. G. G.

Distribution of limestone in the deep sediments of the ocean. J. THOULET. *Compt. rend.* 174, 1249-51 (1922).—Samples were collected near the Azores, Canary and Cape Verde islands from depths of 611-6035 m. Of the 109 specimens obtained 84 were of the grade called sandy mud (*vase sableuse*). The limestone content in sediments from a depth of 614 to 1000 m. was 41%, and for each additional 1000 m. of depth was 46.4, 53.1, 48.8, 68.8 and 48.6 resp. The relation of the  $\text{CaCO}_3$  content to the surrounding factors is discussed. L. W. RIGGS

Variations of chemical composition of sea water and the evaluation of its salinity. G. BERTRAND, FREUNDLER, AND MILLE MÈNAGER. *Compt. rend.* 174, 1251-3 (1922).—The difficulties of detg. the compn. of sea water by ordinary chem. analysis are described, also the unsatisfactory results by detns. of d. and Cl and from these data calcg. the salinity by the tables of Knudsen. In this study sea waters were made up synthetically and various constituents detd. The results show that sea water is not so uniform in compn. as has heretofore been assumed and that the method of Knudsen fails to give correct results when applied to the waters of the Mediterranean. L. W. RIGGS

Great dustfall of March 19, 1920. ALEX. N. WINCHELL. *Am. J. Sci.* 3, 349-64 (1922); cf. C. A. 12, 2514.—The dust was first noticed in the upper layers of a 0.4 in. of snow and sleet, to which it gave a grayish tinge. Samples were immediately collected from measured areas in Madison, Wis., 2 other localities in Wis., 2 in each of Iowa and Mich. and one in Minn. Samples of dust were also received from Pa., Ky., and Mass. The history of the storm is traced and indicates that the dust apparently came from northeastern Col. and southeastern Wyo., with smaller contributions from most of the southwestern states. It was deposited over most of the eastern half of the U. S. Anal. of 3 samples collected at Madison averaged:  $\text{SiO}_2$  67.20,  $\text{Al}_2\text{O}_3$  13.71,  $\text{FeO}$  2.17,  $\text{MnO}$  0.39,  $\text{MgO}$  1.76,  $\text{CaO}$  1.74,  $\text{Na}_2\text{O}$  2.11,  $\text{K}_2\text{O}$  2.30,  $\text{H}_2\text{O}$  above  $105^\circ$  3.22,  $\text{TiO}_2$  0.53,  $\text{P}_2\text{O}_5$  0.15, N 0.38, loss on ignition 5.62, sum 101.28%. These figures vary widely from those of dustfalls in Italy, England and New Zealand but are in close agreement with those of 6 samples of Miss. valley loess. The foreign dust contained about two-thirds as much  $\text{SiO}_2$ , more Al, Fe, and Ca and gave greater loss on ignition. The mineral compn. calcd. from the analysis shows an av. of 37% quartz, 17.7 albite and 13.2 of orthoclase. A mechanical analysis of the dust gave clay 25.57, fine silt 11.91, medium silt 44.09, coarse silt 11.35, very fine sand 5.04, fine sand 0.87, medium sand 0.05, coarse sand 0.03% fine gravel none. The org. constituents consisted of fragments of vegetation, spores, trichomes, diatoms, starch grains, grass cells and bits of charcoal. The wt. of dust from 7 localities ranged from 12.9 to 29.3 tons per sq. mi. The European dustfall of 1901 was calcd. to be 2 million tons, and this fall appears to have been quite as large. L. W. RIGGS

New studies on the color changes of minerals by radiations (DOELTER) 3. The crystal forms of the substituted aliphatic ammonium bromo-selenates and -tellurates and their relations to the corresponding platinites (MAIER) 2. Preparation of some fluorescent and phosphorescent compounds (ANDREWS) 2. W production in Germany during the war (SUCHANEK) 9. Extraction and purification of Se from the thortveitite of Madagascar (URBAIN, URBAIN) 6. Fireclays of the eastern coalfields of Kentucky (RUES) 19.

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBERT S. WILLIAMS

**Henry Marion Howe.** WM. CAMPBELL. *Science* 55, 631-3(1922).—Obituary.

E. H.

**The roasting of zinc-blende ores.** GILBERT RIGG AND W. J. McBRIDE. *Mining Mag.* 26, 139-45(1922).—Roasting of Zn concentrates by the Broken Hill Associated Smelters, Electrolytic Zinc Co. of Australia, and the Broken Hill South is carried out in 2 stages, roasting first from 30 down to 9% S in a multiple-hearth furnace, and then down to 1% S on a Dwight & Lloyd machine. Fuel has been reduced to 16.5 lb. of coke breeze per ton of ore roasted, and labor to 1 man per 5 tons of ore. The charge is 100% 30-mesh and 25% 160-mesh. There are equal vols. of ore particles and voids in the charge. A particle of ZnS requires 27,750 times its vol. of air for dead roasting, and 20,000 times for reduction to 9% S. A thickness of 1/200 in. is roasted between each rabbling in the hearth furnace. The fact that changes in rabble design had little effect shows that the amt. of surface exposed by each rabbling is well in excess of that which can be supplied with O. To hasten the O supply in the lower hearths, air is blown in through nozzles at high velocity. The air is made to carry in fine concentrates in order to counteract the cooling effect of the air and the lower S content of the lower hearths. In the D. & L. roasting the operation takes 14 min., during which the interstitial gas in the charge is renewed 18,600 times, or 22 times per sec. Air passes through the charge at 8.3 linear ft. per sec. The mean time to roast one ore particle is 1.87 sec. Temp. in the hearth furnace is 860-900°; in the D. & L. the temp. would go high enough to cause fusion if the feed contained over 9% S. Some very fine material is necessary to act as a binder on the coarser grains; about 2% of plastic clay is sometimes added to make up for deficiency of fine material. Heat balances and other calcs. are given. A. BUTTS

**The evolution of metallurgy and the role of France in its evolution.** LÉON GUILLÉT. *Bull. soc. ind. Mulhouse* 88, 186-99(1922).—An address. A. P.-C.

**Gold, silver, copper, lead and zinc in New Mexico and Texas in 1920.** CHAS. W. HENDERSON. U. S. Geol. Survey, *Mineral Resources of U. S., 1920*, Part I, 549-63 (preprint No. 29, published June 12, 1922).

E. H.

**Zinc in 1921.** C. E. SIEBENTHAL AND A. STOLL. U. S. Geol. Survey, *Mineral Resources of U. S., 1921*, Part I, 21-33(preprint No. 5, published June 17, 1922).

E. H.

**The production, manufacture, and use of molybdenite; and the production of ferro-molybdenum.** MEHREN. *Edel-Erden u. Erze* 3, 25-6, 39-40(1921-2).—This paper briefly reviews all the process for the refining of molybdenite. E. F. HOLDEN

**Tungsten production (in Germany) during the War.** HANS SUCHANEK. *Edel-Erden u. Erze* 3, 27-9(1921).—German war demands for W were supplied from Zinnwald, Platten, Johannegeorgenstadt, Schönfeld, and Schlaggenwald. The sources were (1) old tin-furnace slags, (2) waste heaps, (3) mining in Zinnwald and Schönfeld. The slags, contg. 5-10% WO<sub>3</sub>, were at once chemically treated; the material from the waste piles had to be first mechanically coned. Three types of ore were treated; pure wolframite (66-68% WO<sub>3</sub>), Sn-W and Sn-Cu-W ore mixts. The pure wolframite was converted into ferro-tungsten in elec. furnaces, the mixed ores were chemically treated to produce a nearly pure W powder. In 1917 production was 133 tons W, but foreign competition after peace stopped the industry.

EDW. F. HOLDEN

**Hydrometallurgy of copper—the Pechey leaching process.** J. D. AUDLEY SMITH. *Chem. Eng. Mining Rev.* 14, 177-81(1922).—A description of heap leaching of Cu ore at the Girilambone and Mt. Hope mines, New South Wales, and the Whim Well mine,

Western Australia. In the Pechey process the soln. after percolation through the heap, which causes  $\text{Fe}_2(\text{SO}_4)_3$  as well as  $\text{CuSO}_4$  to form, is sprayed through coke against an ascending current of  $\text{SO}_2$ . This reduces ferric to ferrous sulfate, with the formation of 2 mol. of  $\text{H}_2\text{SO}_4$  for every mol. of  $\text{SO}_2$ , and thus supplies acid for leaching. A discussion of costs is given.

A. BUTTS

**Making centrifugal castings.** LEON CAMMEN. *Foundry* 50, 460-5(1922).

W. A. MUELLER

**Properties of so-called amorphous metal.** REGINALD S. DEAN. *Chem. Met. Eng.* 26, 965-6(1922).—The occurrence of a high degree of ductility and malleability as characteristic of the metallic state is not dependent on the existence of any particular space lattice but depends on the lattice being built of the same kind of atoms between which no valencies are active. As all positions occupied by atoms are equal, gliding may take place. The existence of gliding and not cleavage as explained by the formation of amorphous metal (undercooled liquid metal) makes necessary certain assumptions as to the properties of amorphous metal. These properties are not those found in strained metals. As an alternative explanation of what happens on inelastic deformation it is suggested that some of the free electrons become bound in the gliding process, thus forming pseudo-molecules. This hypothesis satisfactorily explains the property changes on inelastic deformation.

R. S. DEAN

**Fatigue of metals.** C. E. STROMEYER. *Colliery Guardian* 123, 1422-3(1922).—An explanatory presentation, showing the use of the fatigue formula  $S = Fl + C(10^6/n)^{0.25}$  in diagram form.

C. C. DAVIS

**A discussion of impact testing methods and the results obtained.** JOHN M. LESSELLS. *Trans. Am. Soc. Steel Treating* 2, 659-72(1922).—Following a discussion of the operations of the Fremont, Charpy, Izod and Stanton impact test machine, L. gives several curves showing the relation between Izod impact values, max. stress, yield stress, reduction of area and Brinell hardness for low-C, medium-C, Ni, and Ni-Cr steels, which had been given different heat treatments. The impact test is valuable in that it shows characteristics in certain materials, particularly Ni-Cr steels, which the tensile tests do not indicate; it corresponds along with other physical properties to variation in heat treatment and is, therefore, valuable for confirmation purposes. It also offers valuable evidence, by observation of the fractures, relative to the thermal treatment which the material has received. Analyses and macrographs are given.

W. A. M.

**Fiber in iron and steel.** F. F. MCINTOSH. *Trans. Am. Soc. Steel Treating* 2, 856-63(1922).—The importance of fiber in the performance of Fe and steel under tests or in service, and the factors which govern its formation and character are discussed. Fiber originates at the time of solidification and its character is detd. by the condition of the molten metal, the condition of solidification and the flow of metal during mechanical deformation. Typical fibrous structures are illustrated by photomicrographs.

W. A. MUDGE

**Interfacial tension between carbide of iron ( $\text{Fe}_3\text{C}$ ) and iron.** F. C. THOMPSON. *Trans. Faraday Soc.* 17, 391-9(1922).—The interfacial tension between  $\text{Fe}_3\text{C}$  and Fe was detd. from the relation existing between the sizes and solubilities of small particles.  $R\theta \log e(\lambda'/\lambda) = (2\sigma/pa)$ , in which  $\lambda'$  is the soly. of  $\text{Fe}_3\text{C}$  in Fe where the globules have a radius  $a$ ;  $\lambda$  is the soly. in the case of large masses,  $\sigma$  is the interfacial tension of  $\text{Fe}_3\text{C}$  against Fe; and  $p$  is the density of cementite. To obtain globules of  $\text{Fe}_3\text{C}$  of different sizes 2 parts of the same sample of Fe wire were quenched from  $780^\circ$ . One was tempered at  $500^\circ$ , and the other heated for several hrs. to  $650^\circ$  and then cooled in air. The sizes of the particles were detd. by magnifying and projecting the image on a glass screen. The solubilities were detd. by the relation existing between the concn. of C in Fe and the cond. of the resulting wire. For the case of *cohenite*, a nickeliferous meteoric mineral, the interfacial tension calcd. was 1350 dynes per cm.

F. E. BROWN

**The diffusion of carbon in metals and the solid solution of carbon in iron.** G. TAMMANN. *Stahl u. Eisen* 42, 654-9 (1922).—The depth of cementation in gas mixts. is detd. metallographically and therefrom the coeff. of diffusion in cm.<sup>2</sup> sec. is calcd. This coeff. varies sharply with the temp. The results calcd. from the authors expts. give  $3.0 \times 10^{-7}$  at 925° and  $19.3 \times 10^{-7}$  at 1000°. Other investigators results recalcd. give comparable values. The depth of C penetration in a given time varies with the carbonizing medium, e. g., for MeOH and H the penetration is 0.05 mm. in 2 hrs. at 950° while with heptane under the same conditions it is 1.47 mm. Mo, W, Ni, Mn and Co alloyed with the iron first increase the depth of carbonization; then as the percentage is increased it decreases again. Sb and V decrease the depth of carbonization in all percentages and Al has no effect. The effect of these foreign metals is, however, so slight that the variations from, one piece of iron to another are to be accounted for by the nature of the intercryst. net-work.

R. S. DEAN

**A new type of transition in iron.** G. BORELIUS AND F. GUNNESON. *Ann. Physik* 67, 227-35 (1922).—The thermoelectromotive force of Fe which had been heated to various temps. and suddenly cooled was found to vary irregularly with the temp. reached in the heat treatment. The curves obtained indicate a series of transitions with all the forms of impure com. Fe studied. They are of an unknown type, and between 100° and 800° there are indications of 7 transitions.

A. E. STEARN

**A new type of transition in iron.** G. BORELIUS. *Ann. Physik* 67, 236-52 (1922); cf. preceding abstr.—Similar expts. gave like results with very pure Fe. In pure Fe these transitions are evenly distributed so that the abs. temp. of the mid-point of the  $n^{\text{th}}$  transition can be approximated by  $T_n = 97n$ . The  $\beta - \gamma$  transition comes when  $n = 12$ ; and in C-contg. Fe the pearlite point comes at  $n = 10$ . Pure Fe with 0.5% Si gave a smooth curve when heated in a vacuum, the evidence of transitions first appearing after reheating in gases.

A. E. STEARN

**The carbonizing process—relation of time and temperature to depth of case.** THEODORE G. SELLECK. *Trans. Am. Soc. Steel Treating* 2, 705-9 (1922); cf. C. A. 15, 2615, 3441.—S. gives a "thermovolumetric scale" for depth of case as a function of time in hrs. The curves were prepd. by comparing exptl. results with the no. of heat units consumed during carbonization under rising temps. Slightly increasing temps. to reduce the time factor may be dangerous if the carbonizing efficiency of the steel and the carburizer are not accurately known.

W. A. MUDGE

**Inversely hard castings and related phenomena.** W. HEIKE. *Stahl u. Eisen* 42, 325-32 (1922); cf. C. A. 15, 2820.—Several cases of inversely hard castings are discussed, among them, a cast iron in which the outside is softer due to excessive graphite formation and a steel showing the so-called black fracture but with a kernel in which no temper C has sepd. It is concluded that the process  $\text{Fe}_3\text{C} \rightarrow \text{C} + 3\text{Fe}$  is considerably affected by the pressure, since a vol. change is involved.

R. S. DEAN

**Note on pre-Roman iron bars.** JOHN MYERS. *J. Soc. Chem. Ind.* 41, 133-4T (1922).—Pre-Roman iron bars more than half in perfect condition were found 1.5 ft. below the surface of the soil. The presence of a chalk subsoil prevented water-logging. Analysis showed combined C 0.06, Si 0.11, S 0.014%, Mn trace, Ni trace, P 0.954%. Microscopic examn. showed a coarse-grain structure and rather broad bands of slag. Prolonged etching with an alc. soln. of picric acid revealed the presence of elongated aggregates of small foliations. Studies of the migrations of P and C lead to the conclusion that this primitive iron was partially carburized and subsequently decarburized, which treatment was responsible for the foliated structure. The foliations revealed by etching reflect the differing rates of diffusion of two solid solns., C and P, and probably a third—O.

W. H. BOYNTON

**The abrasive qualities of plain carbon and alloy steels.** A. M. COX. *Trans.*

*Am. Soc. Steel Treating* 2, 673-9(1922).—Ordinary tension and Brinell tests are not a reliable index to the abrasive qualities of steels. Abrasive resistance increases with density and hardness. The tests were carried out in a specially constructed machine to give the rolling and sliding action to which gear teeth are subjected; the pressure on the test roller was a dead load of 240 lbs. C steels showed more uniform results than the Ni-Cr steels and less av. wear loss. Further tests will be undertaken to det. the combined effect of ductility and hardness on the abrasive properties. Complete data are recorded in several curves and photomicrographs. W. A. MUDGE

An investigation of the properties of chilled iron car wheels. J. N. SNODGRASS AND F. H. GULDNER. *U. of Ill. Eng. Expt. Sta., Bull.* No. 129, May 1922.—This bulletin reports the results of a series of strain gage tests conducted to det. the strains caused by mounting a wheel on its axle and the strains caused by static or wheel loads. The chem. analysis and phys. properties at different parts of the wheel before mounting are also given. The tensile strength of the metal taken from different parts of the plates of 3 wheels ranged from 23,300 to 32,800 lb. per sq. in. and the modulus of elasticity ranged from 14 to 28 million lbs. per sq. in. There was considerable variation in the chem. compn. of the several specimens. Neither Brinnell nor scleroscope hardness showed any distinct relation to the ultimate strength of the wheel iron nor to each other. The strains caused by mounting the wheels on the axles only, are greatest in the hub near the axles. These strains, although apparently high in the case of the greatest values recorded, are steady and not repeated as is the case with most service strains. The highest strains extend through a comparatively thin layer of metal near the axles and this strained layer is backed by other layers of less strained metal. In general, most of the static load is transmitted from hub to rail through the outer plate. The inner plate may be considered as affording reserve capacity to absorb the effect of side thrust on the flange when rounding curves. Pressing the wheel on the axle produces much greater stress or strain within the wheel than the normal static load. In the absence of impact, side thrust, etc., abnormally heavy loads may be sustained without increasing the existent normal strains enough seriously to stress the wheel. The appendix contains the results in tabulated form and also a short history of the chilled iron car wheel with information concerning its manuf. and special properties. F. W. COBB

Cobalt chrome steels. F. W. KAYSER. *Electrician* 88, 421(1922).—The Co-Cr steels that have revolutionized the magneto industry originated in Sheffield and not in Japan. C. G. F.

Action of metallurgical additions on the anomaly of the dilatability of nickel steels. CH. ED. GUILLAUME. *Compt. rend.* 170, 1433-5(1920); cf. *C. A.* 16, 1927.—A detailed study of the action of Mn, Cr and C on the dilatability of Ni steels over the range of easily obtainable alloys, and of a series of Ni steels contg. 5% of Cu. The addn. of any of these three constituents diminishes the intensity of the anomaly of dilatability in the region of its min. value. In the case of Mn, C, and Cu, within a limited region of Ni content, ternary alloys are obtained which are slightly less dilatant than the binary alloys with the same Ni content. If the other constituents are well known, the measurement of the dilatability gives a method of fixing the C content to within 1 in 10,000. J. C. S.

Thermal change of the elastic properties of nickel steels. P. CHEVENARD. *Compt. rend.* 170, 1499-1502(1920).—A study of the anomaly of elasticity of 28 nickel steels contg. varying proportions of Ni and only just the amt. of Mn indispensable to forging. The method employed was to measure the time and decrement of oscillation of a torsion pendulum constructed with wires of the steels. The coeff. of variation of the modulus of torsion is characterized, in reversible alloys, by a rapid increase to a max., which corresponds with the min. of dilatability, and then a gradual diminution. For alloys

with a stable state in the cold, the results do not indicate any irregularity. Tempering and hammer hardening diminish the value of the modulus of torsion, which increases, however, with the temp. of annealing, there being a max. of rapidity between 450° and 550°. As in the case of the dilatability, the thermo-elastic coeff. is affected by the treatment which the alloy undergoes. Contrary to what happens in the case of the dilatability, however, hammer hardening diminishes the amplitude of the anomaly, while tempering increases it. J. C. S.

**The spontaneous passivity of chrome steels.** G. TAMMANN. *Stahl u. Eisen* 42, 577-8(1922).—If two metals form a continuous series of solid solns. the resulting alloy is attacked by reagents which attack the least noble of the 2 metals up to a limiting percentage of the more noble metals. A single metal, however, may vary in its ionization tendency according to its previous treatment; thus Fe which has been immersed in concd. HNO<sub>3</sub> becomes passive and will no longer ppt. Cu. This condition, however, is unstable with Fe. Cr becomes rapidly passive in air or aq. solns. The limit of attack by reagents of the Fe-Cr alloys is accordingly detd. by the amt. of Cr necessary to make the alloy spontaneously passive; this is accomplished with 20% Cr. The high-Cr stainless steels are accordingly permanently passive. R. S. DEAN

**Theory of invar.** K. HONDA AND H. TAKAGI. *Trans. Faraday Soc.* 15, 54-61 (1920); *Science Abstracts* 24A, 147.—It has been considered that invar represents a definite compd. of Fe and Ni, but the authors show that many other alloys of these metals exhibit regions of zero thermal coeff. of expansion at various temps. The particular alloy, invar, happens to have this region at room temp., and it would be possible, by the addn. of small quantities of other elements, to bring this point of min. coeff. either slightly above or slightly below room temp., so that the coeff. of expansion would have a very small negative or positive value at room temp. H. G.

**Ball steel.** HILTON G. FREELAND. *Trans. Am. Soc. Steel Treating* 2, 898-911 (1922).—The production of ball steel from the manufacturer's viewpoint with practical methods of overcoming the chief types of defects is described. Regular ball steel for ball bearings is elec.-furnace steel contg. 0.95-1.05 % C and 0.75-1.65 % Cr, depending upon the ball size. Raw material of the finest grade is essential for good results. Decarbonization is the greatest source of defects and results in soft spots on the ball if greater than 0.004" in depth. When present it appears in two forms; (1) the surface metal is composed almost entirely of ferrite possessing a sharp line of demarcation at its junction, with the metal having the min. C allowance, and (2) an accentuated graded decarbonization, which is more difficult to detect than (1). Preliminary tests of the decarbonization factor of the steel are carried out by heating small wires of the metal in an electric furnace and quenching in oil or water from a temp. slightly higher than that actually required to produce the desired grain size in the finished product. Typical defects and the method of testing are illustrated in several photographs and photomicrographs. W. A. MUDGE

**Effect of sulfur on rivet steel.** ERNEST E. THUM. *Chem. Met. Eng.* 26, 1019-24(1922).—Thirteen 75-ton heats of basic open-hearth steel varying in S from 0.03 to 0.08% and one with 0.18% S were made and rolled into bars by the Carnegie Steel Co. Details of results of analysis and of tests on phys. properties are given. The summary and conclusions based on a study of the diagrams issued by the Joint Committee on Investigation of P and S in steel from A. S. T. M. and deductions from other data follow: S up to 0.10% in rivet steel does not affect the hot or cold shortness. A basic open-hearth rivet steel with compn. C 0.11, Mn 0.43, P 0.01, and S 0.03 has the following tensile properties when tested in 1-in. bars, as received from the mill: Tensile strength, 49,500 lbs. per sq. in.; yield point, 36,000 lbs. per sq. in.; reductions in area, 72%; elongation in 2 in., 44%. Each additional 0.01% S up to 0.10 decreases the tensile strength 200

lbs./sq. in. and increases the yield pt. 100 lbs./sq. in. Annealing these bars for 30 min. at 925° to 950° and furnace cooling lowers the tensile strength 4000 lbs./sq. in. and the yield point 8000 lbs./sq. in. but does not affect the reduction in area or elongation. Transverse properties are substantially unaffected by annealing. Quenching accentuates the effect of S. Tests show definitely that S content has a strong effect on the impact strength. S. has practically no effect on hardness. The static strength of rivets in a single or double shear is closely approximated by the shearing strength of the rivet bar, and for steel of the analysis given above equals 38,200 lbs. per sq. in. Each 0.01% S decreases this value 300 lb./sq. in. "The max. S now allowed in structural steel rivets (0.045%) is at least 0.01% below the point where S will damage the strength of a well made rivet steel, as far as its performance can be predicted by known tests."

F. W. COBB

**Influence of temperature upon the mechanical properties of cast iron.** F. GRAZIANI. *Giorn. chim. ind. applicata* 4, 53-61(1922).—The limit of temp. beyond which the resistance (tensile) of cast Fe rapidly decreases is 500°. There is a slight increase of resistance up to about 250°. As to the influence of P content upon resistance, no decided relations could be found. A higher content of P is more likely to give good values for tensile resistance at high temps.

ROBERT S. POSMONTIER

**The temper colors of metals.** G. TAMMANN. *Stahl u. Eisen* 42, 615-9(1922).—When a metal is exposed to I, Cl or air at high temps. it becomes colored, first bright yellow, then brownish yellow, orange, red, purple, violet, indigo, etc. Sixty different colors can be distinguished up to the gray red of the 4th order. The colors result from interference in the light reflected from the metal by the thin layers of reaction product. The thickness of the layers can be calcd. from the color and the refractive indices of the reaction product. The thickness of the layer of reaction product depends on the temp. and the time; at a given temp. the thickness of the layer varies as the logarithm of the time. The thickness varies exponentially with the temp. Data are given for the tarnishing of Ni and Fe in air and of Ag in I vapor. By extrapolation the starting velocity as well as the time necessary to form a visible layer at 15° may be calculated for all metals in air. The starting rate falls off with extreme rapidity so that although iron would have passed through the entire range of colors in 1 min. at 15° if its starting rate persisted it requires  $25 \times 10^{17}$  years to produce a visible color on Fe in dry air. R. S. D.

**Theory of tempering of steels in relation to an allotropic form of iron.** G. SIROVICH and R. ARIANO. *Met. italiana* 14, 3 17, 37-52(1921).—(1)  $\alpha$ -Fe exists in 2 forms,  $\alpha_1$  and  $\alpha_2$ . The form  $\alpha_1$  is stable at ordinary temp.; it is hard, magnetic and capable of dissolving C. At about 370° the form  $\alpha_1$  changes to  $\alpha_2$ , which is more plastic and magnetic and incapable of dissolving C. In pure Fe the transformation of  $\alpha_1$  to  $\alpha_2$  cannot be suppressed by tempering. (2) Martensite is a soln. of C in  $\text{Fe}\alpha_1$ . It can be obtained in ordinary steels, besides by tempering, also by proper maturation of the metal at a temp. lower than that of change of  $\alpha_1$  to  $\alpha_2$ . Hence martensite is stable at ordinary temp. (3) The hardness of martensite is due solely to the soln. of C in Fe. (4) The martensite of ordinary steels remains, on heating, in a state of mixed crystals until it becomes satd. with  $\text{Fe}\alpha_2$  or with cementite. The sepn. of the one or the other of these takes place at first with invariant equil., then at a eutectoid point, where the martensite simultaneously deposits the 2 components with formation of pearlite. In special steels, the field of stability of the mixt.  $\text{Fe}\alpha_2$  and cementite (troostite, pearlite, sorbite) may be suppressed, and hence may present the direct reversible transformation of martensite to austenite.

ROBERT S. POSMONTIER

**Factors influencing mass heat treatment.** W. B. CROWE. *Trans. Am. Soc. Steel Treating* 2, 869-74(1922).—The factors which occur before the actual heat treatment operations, viz., chem. compn., mechanical design and the occurrence of "Sonims"

as influencing the mass heat treatment are considered. When the mass has a length and width several times that of the thickness, 1 hr. per in. of thickness for heating to the desired temp. and  $\frac{1}{2}$  hr. per in. for satn., are allowed. W. A. MUDGE

**Effect of heat treatment on mechanical properties of a carbon-molybdenum and a chromium-molybdenum steel.** H. J. FRENCH. *Trans. Am. Soc. Steel Treating* 2, 769-98(1922).—Tensile, impact, Brinell, and scleroscope tests, supplemented by a thorough microscopic examination, were made on (A) 0.20% C, 0.94% Mo and (B) 0.27% C, 0.88% Cr and 0.52% Mo steels to det. the effect of different heat treatments upon their mechanical properties. For (A) there is a crit. rate of cooling which will lower  $A_{r1}$  for each max. temp. of heating. The higher the initial temp. the slower is the rate of cooling required to produce the lowered transformation, but by whatever combination this is produced the position of the "low point" is fixed within a narrow temp. range, about 525°. The suppression can readily be brought about by increasing the rate of cooling.  $A_{r2}$  is fixed at about 760° and is independent of the max. temp. of heating or rate of cooling. A high-temp. transformation is observed slightly above and almost merging with  $A_{r1}$  when the steel is cooled from temps. at or above 960° at a rate of 0.15° per sec. but it is not observed in cooling at much faster rates. Water quenching is preferred for the production of definite tensile strength on account of the higher proportional limit, ductility, and impact values obtained; conversely better tensile properties are obtained for a given impact resistance. Increasing the quenching temp. from 910° to 980° does not alter materially the mech. properties of the steel when subsequently tempered at 540°. The most suitable temp. from which to harden the steel is approx. 910°. Free ferrite is found after quenching from 830°, but the observed changes in mech. properties with rise in quenching temp. within this range are unexplainable, and are opposite to the changes found in plain C steel under similar conditions of treatment, except as related to a Mo change. The eutectoid appears highly emulsified in all cases and not like the characteristic structure of pearlite found in slowly cooled C steel. For (B) the  $A_{r1}$  transformation is first split and lowered in cooling from 960-1000° at a rate of 0.150 per sec.; the "low point" is observed at about 480°. With water quenching from the highest temp. a lower hardness is obtained than with similar cooling from 960°. In this case (B) acts like (A) except that the observed changes are produced from high temps. In normalizing a low limit of proportionality and impact resistance are obtained at temps. of 780-845°. Previous results have been confirmed in that no material changes in tensile or impact properties are produced by oil quenching from a wide range of temp., when the steel is subsequently tempered at 540°. The resistance of the oil-hardened steel to decrease in strength by tempering is also shown. A tempering temp. of 650° is necessary to increase the low impact values of the hardened steel. Complete data are given in many references, curves, tables, and photomicrographs. W. A. MUDGE

**The influence of heat treatment upon the magnetic properties of steel.** LANCHELOT W. WILD. *Trans. Am. Soc. Steel Treating* 2, 696-704(1922).—W. measured the magnetic intensity ( $4\pi I$ ) and the coercive force ( $H_c$ ) with the object of obtaining a general survey of the effect of reheating C steel to various temps. and slowly cooling it. Cylindrical specimens, 1" long and  $\frac{1}{4}$ " diam., and a magnetic force of  $H = 200-4000$  were used. Results for Swedish charcoal Fe, and for C, Ni, Cr, and W steels are given in curves by plotting  $4\pi I$  or  $H_c$  against temp. The satn. intensity of Fe is unaffected by heat treatment although  $H_c$  declines as soon as hardening strains are removed and still further as grain growth commences. The addn. of C to Fe lowers satn. intensity throughout the temp. range but there is no direct relationship between  $H_c$  and C content. The most notable feature of C steel is the increase in  $H_c$  when  $Fe_3C$  is pptd. from soln. (200-300°). Ni steel behaves similarly to C steel; W steel follows the general



line of C steel except that the C features are less pronounced and there is a decided drop in  $4\pi I$  and an increase in  $H_c$  when a reheating temp. of  $900^\circ$  is exceeded. The Cr steel (contg. 87% Fe) is quite remarkable since its satn. intensity is only 67% that of pure Fe and this value remains almost entirely unaffected by heat treatment.  $H_c$  does not drop on tempering nearly as rapidly as in other steels and the rise on heating to over  $900^\circ$  is even more pronounced than in W steel. All 3 alloy steels show a distinct hump in  $H_c$ , the Cr steel at  $400^\circ$ , the W steel at  $800^\circ$ , and the Ni steel at  $700^\circ$ .

W. A. MUDGE

**The heat treatment of chrome steel for ball bearings.** HAAKON STYRI. *Trans. Am. Soc. Steel Treating* 2, 718-29(1922).—For production of best Cr-steel bearings (1.0 % Cr and 1.4 % Cr) S. emphasizes the necessity of thorough soaking at the temp. before quenching and a regulation of quenching temps. to correspond with an increase in the size of the specimen and system of quenching. Troostite formed during the drawing of martensite is homogeneous, while that formed during the quenching period occurs in conjunction with martensite or sorbite, and is not entirely homogeneous even when it appears to occur alone. Several excellent photomicrographs at high magnification (1000 diam.) are given as illustrations.

W. A. MUDGE

**Heat treatment of large forgings by oil, gas and electricity.** W. E. MCGARREY. *Trans. Am. Soc. Steel Treating* 2, 799-801(1922).—Although the initial cost of the elec. furnace is greatest it is most economical to operate for this type of work because of decreased maintenance costs, and greater uniformity of product. With proper regulation one heat treatment should be sufficient.

W. A. MUDGE

**Planning and routing of forging and heat treatment work at Watertown arsenal.** F. C. LANGENBERG. *Trans. Am. Soc. Steel Treating* 2, 763-8(1922).—A graphical description with discussion of the various steps used at Watertown Arsenal for the production of the 155-mm. gun-tube forging.

W. A. MUDGE

**The change in dimensions of high-speed steels in heat treatment.** M. A. GROSSMAN. *Trans. Am. Soc. Steel Treating* 2, 691-5(1922).—The change in length after heat treatment of 13-18% W, 3.5% Cr, and 0.5-1.0% V steel by means of the variation in length of cylinders was detd. by comparing the original length in the annealed condition with that after quenching, hardening and drawing at various temps. The high-speed steels of this type expand on hardening; up to a certain limit the higher the hardening temp. the greater will be the expansion. When this hardened high-speed steel is drawn it contracts at temps. up to  $900-1000^\circ$  F. When heated at  $1100^\circ$  F. it expands, and when heated further to high temps. it contracts until it finally reaches approx. the original dimension in the annealed condition.

W. A. MUDGE

**The efficacy of annealing overstrained steel.** I. S. COWDREY. *Trans. Am. Soc. Steel Treating* 2, 802-8(1922).—Overstrain of metal, when its temp. is below the transformation range, results in the production of undesirable properties tending to render the metal unsuited to withstand sudden and shock loads, and unsafe for use. Annealing at  $1760^\circ$  F. for  $1-1\frac{1}{2}$  hrs. with the specimen wrapped in C and asbestos or in cast-Fe chips in a loosely closed tube suffices completely to restore the normal properties of low-C steel even after the most severe overstrain. Photomicrographs show typical structures of overstrained and annealed materials.

W. A. MUDGE

**The importance of the proper heating and cooling of steel.** JOHN A. SUCCUP. *Trans. Am. Soc. Steel Treating* 2, 673-9(1922).

W. A. MUDGE

**Corrosion of iron.** R. KATTWINKEL. *Z. angew. Chem.* 33, I, 156(1920).—An incrustation which formed in a steam pipe had strong magnetic properties and consisted entirely (99.12%) of magnetic  $Fe_3O_4$ .

J. C. S.

**Suggested basis for an index of corrosion for iron and steel.** W. D. RICHARDSON. *Am. Inst. Chem. Eng.* June, 1920 [advance copy] 8 pp.—The index of corrosion

(C) recommended represents the relation between the loss per cm.<sup>2</sup> per hr. in *N* HNO<sub>3</sub> (O), and the similar loss in *N* H<sub>2</sub>SO<sub>4</sub> (H). The index cannot yet be expressed as a simple ratio  $C = O/H$  owing to the small no. of data available. It has to be considered as really consisting of two indices written together as a ratio for convenience, but subjects for sep. consideration. *H* the index for one metal ought to be compared with *H* the index for another and similarly the two *O* indices. J. S. C. I.

**Protection of iron against rust.** J. A. HEYMAN. *Water en Gas*, Mar. 31; *Water and Water Eng.* 24, 227(1922).—Iron in contact with water gives off Fe<sup>++</sup> ions; if air is present, Fe<sup>++</sup> changes to Fe<sup>+++</sup> and Fe(OH)<sub>3</sub> is pptd. Iron would not rust in moist air were temp. and pressure const.; otherwise moist air has the same effect as H<sub>2</sub>O. Lengths of iron pipe were sand-blasted, painted with protective compns. and placed in glass cylinders contg. gelatin 14%, K<sub>4</sub>Fe(CN)<sub>6</sub> 0.1%, and 0.01% phenol, in H<sub>2</sub>O. Phenol was for prevention of bacterial growth. Appearance of Fe was demonstrated by blue color in the jelly. The best protection was afforded by one coat and immediate immersion. No compn. gave absolute protection. The action started in patches but went on over the entire surface.

JACK J. HINMAN, JR.

**Prevention of corrosion of metals by water in a closed system.** PERRY WHIST. *J. Ind. Eng. Chem.* 14, 601-7(1922).—Metals rust to an appreciable extent only when they are in contact with both moisture and free O<sub>2</sub>. In all cases where H<sub>2</sub>O is confined in a closed system the free dissolved O<sub>2</sub> in the H<sub>2</sub>O is either the principal cause or the principal contributory element causing corrosion. The removal of this O<sub>2</sub> will in most cases practically stop corrosion, and in other cases materially reduce the corrosion caused by other agencies. This prevention applies equally well to brass, Fe, and steel. Corrosion increases with temp.; at 180° F. it is 10 times, and at 210° F. 100 times, as rapid as at 50° F. The effect of strong and weak acids and alkalies, and salts (carbonates, chlorides, sulfates and nitrates) with and without the presence of free O<sub>2</sub> is given; free O<sub>2</sub> is necessary to produce serious corrosion. Two com. methods for the elimination of dissolved O<sub>2</sub> are given: (1) deaerating deactivation, and (2) deoxidizing deactivation.

W. A. MUDGE

**Electromotive properties of certain binary alloys. I. Theoretical considerations.** ROBERT KREMMANN. *Z. Metallkunde* 12, 185-91(1920).—A general theoretical account is given of the dependence of the potential of solid metallic alloys on their compn., and the application of this relationship to the elucidation of their constitution. **II. Electromotive behavior of silver-cadmium alloys.** ROBERT KREMMANN AND HELMUT RUDERER. *Ibid* 209-14.—A series of cells composed of Cd, CdSO<sub>4</sub> and Cd-Ag alloys of varying compn. has been examd., the initial potential observed immediately on bringing the electrodes into the soln., and the final potential, generally attained after 6 to 8 hrs., being observed. The initial potential sinks rapidly at first, then more slowly, and finally asymptotically approaches its final value. The initial potential of alloys richer in Ag is somewhat variable. The less noble values only decrease slowly and fairly uniformly at first from the Cd potential with increasing Ag content (to about 50 millivolts), and only exhibit a marked drop in potential with more than 90 at. % Ag; in addn. to these less noble values, alloys contg. more than 25% of Ag exhibit higher initial potentials (as much as 150-170 millivolts greater than that of Cd). Since this observation is also made with alloys which have been tempered at about 400°, the fluctuations cannot be attributed to failure to ensure equil. in their prepn. The initial and final potentials differ but little from one another with alloys contg. up to 20 at. % of Ag; from 20 to 40 at. % the latter fall rapidly to the nobler potentials, and with increasing Ag content approach the potential of pure Ag asymptotically. In the authors opinion, the least noble of the measured initial values is the true potential of the alloy. The compds. present in the series of alloys, and also the mixed crystals up to about 90

at. % of Ag are, therefore, but little more noble than Cd. Owing to the absence of Ag ions, it would be expected, on theoretical grounds, that Ag would pass into soln. and the potential gradually become less noble. The non-fulfilment of this expectation is explained by the authors on the supposition that local elements are immediately formed in which increasingly noble layers are developed by the soln. of the less noble portions, and this hypothesis also accounts for the occurrence of more noble, as well as less noble, initial potentials. The falling away of the final potentials from 20 to 40 at. % of Ag is probably to be ascribed to a galvanic resistance limit, such as has been described by Tammann. **III. Electromotive behavior of cadmium-antimony alloys.** ROBERT KREMMANN AND JULIUS GMACHL-PAMMER. *Ibid* 241-5.—A series of cells composed of Cd, normal  $\text{CdSO}_4$  soln., and Cd-Sb alloys of varying compn. has been examd. in the manner described previously. The initial and final potential did not exhibit any marked differences. Slowly cooled alloys showed a slight rise in potential (about 20 millivolts nobler than Cd) at 40 atom % of Sb, due to the unstable compd.  $\text{Cd}_2\text{Sb}_2$ ; this potential increases between 90 and 100 at. % of Sb to that of the latter metal. Quenched alloys, on the other hand, exhibit a more definite increase in potential (about 150 millivolts) at 50 at. % of Sb caused by the stable compd.  $\text{CdSb}$ ; this potential remains practically const. for alloys which do not contain more than 90% of Sb. The surprising result that the stable equil. is set up in quenched, the unstable in slowly cooled, alloys, is confirmed by metallographic investigation. Kurnakov and Konstantinov find that stable equilibria are only attained by seeding or vigorous agitation; quenching is accompanied by violent mechanical shock. **IV. Electromotive behavior of alloys of thallium with zinc, lead, bismuth, tin, antimony, and cadmium.** ROBERT KREMMANN AND ALBERT LOBINGER. *Ibid* 246-56.—In the cells,  $\text{Zn}|N\text{-ZnSO}_4\text{ soln. Zn}_{(1-x)}\text{Tl}_x$ , the potential of Zn is observed with alloys contg. up to about 95 at. % of Tl; the initial and final potentials are almost identical. In the series,  $\text{Tl}|\text{TlCl soln. satd. at } 15^\circ|\text{Tl}_{(1-x)}\text{Pb}_x$ , the potentials from 0 to 20 at. % of Pb are practically equal to those of Tl; from 50 to 100 at. % of Pb they are equal to the Pb potentials; between 20 and 50 at. % of Pb the potentials pass into one another asymptotically. The final values, which are otherwise identical with the initial potentials, show a marked rise in the case of the alloys of very high Pb content which is attributed to the formation of layers of oxide. In the series,  $\text{Tl}|\text{TlCl soln. satd. at } 15^\circ|\text{Tl}_{(1-x)}\text{Bi}_x$ , the initial potential of the alloys diminishes continuously from 0 to 25 at. % of Bi in conformity with the equil. diagram, then remains almost const. to 58 at. % of Bi, subsequently diminishes rapidly to 61 at. %, and then remains almost const. to pure Bi. The two compds.,  $\text{BiTl}_3$  and  $\text{Bi}_2\text{Tl}_3$ , are relatively little less noble than Tl (about 50 and 140 millivolts, resp.), and much less noble than Bi (about 250 and 340 millivolts, resp.). The initial potential of the cells,  $\text{Tl}|\text{TlCl soln. satd. at } 15^\circ|\text{Tl}_{(1-x)}\text{Sn}_x$ , remains practically const. from 0 to 90 at. % of Sn, and then falls continuously to the value of the latter metal. Re-examn. of the diagram of Kurnakov and Ruschin indicates that Sn scarcely forms mixed crystals with Tl, while the latter only does so with at the most, 40 at. % of Sn. The Tl potential is shown by the series,  $\text{Tl}|\text{TlCl soln. satd. at } 15^\circ|\text{Tl}_{(1-x)}\text{Sb}_x$ , to 80 at. % of Sb; the value then diminishes slowly at first, rapidly with more than 99 at. % of Sb, to the potential of the latter. Electromotive evidence of the existence of the compd.,  $\text{SbTl}_3$ , is not observed. In conformity with the equil. diagram, examn. of the system  $\text{Tl}|\text{electrolyte}[\text{Cd}_{(1-x)}\text{Tl}_x]$ , did not give any indication of the formation of a compd., the potentials corresponding closely with those of Sn.  $\text{TlCl soln. satd. at } 15^\circ$  and shaken with Cd turnings and  $N\text{-CdSO}_4$  soln. agitated with Tl turnings were used as electrolyte. **V. Electromotive behavior of tin-sodium alloys.** R. KREMMANN AND JULIUS GMACHL-PAMMER. *Ibid* 257-62.—The authors have investigated the series  $\text{Sn}|0.1N\text{-NaI soln. in pyridine}|\text{Sn}_x\text{Na}_{(1-x)}$  and also in the cases of alloys contg. less than 67 at. % of Na, the cells  $\text{Sn}|N\text{-Na sulfate soln. in water}|\text{Sn}_x\text{-}$

$\text{Na}_{(2-x)}$ . The existence of 4 compds.,  $\text{Na}_3\text{Sn}$ ,  $\text{Na}_2\text{Sn}$ ,  $\text{NaSn}$ , and  $\text{NaSn}_2$  is indicated electromotively, but the presence of  $\text{Na}_4\text{Sn}$  could not be detected.  $\text{NaSn}_2$  is at least 980,  $\text{NaSn}$  at least 1080, millivolts less noble than Sn.  $\text{Na}_3\text{Sn}$  and  $\text{Na}_2\text{Sn}$  are 520 and 240 millivolts nobler than Na.

J. C. S.

**Chemical and electrochemical properties of copper-zinc alloys prepared by melting or by electrochemical processes.** FRANZ SAUERWALD. *Z. anorg. allgem. Chem.* 111, 243-79 (1920).—An account is given of the action of various reagents, such as solns. of  $\text{CdSO}_4$ , Cu sulfate,  $\text{H}_2\text{SO}_4$ ,  $\text{HCl}$ ,  $\text{Ti}_2\text{SO}_4$ , Pb chloride,  $\text{Pb}(\text{NO}_3)_2$  and alkali sulfides, on alloys of Zn and Cu prepd. by various methods and of varying compn. The e.m.f. of alloys (100-18.4% Cu) against a soln. of  $\text{ZnCl}_2$  has also been measured, and the change with temp. ascertained. It is shown that the behavior of Zn-Cu alloys is governed by the two factors which det. the chem. and electrochem. behavior of mixed crystals, namely, the nature of the partition of the components and the mobility of the atoms in the crystal lattice. It is shown that the mixed crystals, obtained by melting, with ordered partition corresponding with the equil. conditions, have chem. and electrochem. properties at the ordinary temp. which to a large extent are independent of the concn. This is to be attributed to the protecting action of the Cu. The properties change sharply and suddenly only on the appearance of a new crystal form with a different lattice, whereby in the case of Cu satd. with  $\gamma$ -crystals, the properties of the compd.  $\text{Cu}_2\text{Zn}_3$  were observed. At  $380^\circ$ , where a considerable mobility of the atoms in the lattice exists, the electrochem. properties of the mixed crystals are dependent on the concn., since the Cu is no longer able to afford a protecting action. In the case of unordered atom partition, which is obtained by electrolytic deposition at the ordinary temps., the Cu is only able to afford a very slight protecting action to the Zn. From this the simple relationship follows that the logarithm of the soln. pressure of the Zn in alloys with unordered partition is proportional to the number of unprotected Zn atoms. The atom partition brought about by electrolysis is to a large extent dependent on the temp., for it is shown that by the electrolysis of molten salts at  $300^\circ$  an alloy is obtained in which the atom partition is very nearly that of the equil. condition.

J. C. S.

**Some electrical properties of nickel and monel wires.** M. A. HUNTER, F. M. SEBAST AND A. JONES. *Trans. Am. Inst. Mining Met. Eng.* 1922, No. 1150-N, 6 pp.—Pure Ni with a low specific resistance and high temp. coeff. can be made by melting electrolytic Ni with the addition of a minimum amt. of Mn. The time for melting is a material factor. The effect of various impurities is indicated. The variation of resistance with temp. for A, B and D grades of commercial nickel and for monel metal were detd. and the transformation points were obtained from the resistance-temp. curves.

F. W. COBB

**Pyrophoric zinc alloys and their utilization.** J. CZOCHRALEKI AND K. LOHRKE. *Z. Metallkunde* 12, 145-9 (1920); cf. Guertler, C. A. 14, 524.—Different refining methods for the removal of Al from these alloys (Zn with 3% Al and 6% Cu) are discussed. Melting with  $\text{NaNO}_3$  and a flux ( $\text{NaCl}$  and  $\text{K}_2\text{CO}_3$ ) seems practicable, the Al being reduced to traces. In expts. made with perchlorate instead of nitrate, with addn. of  $\text{K}_2\text{CO}_3$  and  $\text{NaCl}$ , even more satisfactory results were obtained. By mixing with Zn oxide and chloride and  $\text{CaCl}_2$  the Al can be removed fairly satisfactorily, but a dense fume of  $\text{AlCl}_3$  is formed which tends to stop up the flues.

J. S. C. I.

**Gas absorption and oxidation of non-ferrous metals.** B. WOYSKI AND J. W. BORCK. *Trans. Am. Inst. Mining Met. Eng.* 1922, No. 1160-N 8 pp.—Since gassing and shrinkage cause porous metal and intercrystalline fissures so that air is admitted, films of oxide are found on the walls of cavities formed from these causes as well as those caused by oxidation. Thus the cause of defects is often mistaken. The most important cause of gassing molten metal is the furnace atm. Gassed metal can be brought back to normal

condition by remelting in an oxidizing atm. A reducing atm. is more troublesome than an oxidizing one.

F. W. COBS

Duralumin. KARL, DORNHECKER. *Schweiz. Chem. Ztg.* 1922, 41-4, 53-6.—A detailed review of the properties of duralumin.

F. P. FLAGG

Information about amalgams. III. Colloidal copper amalgams. C. PAAL AND H. STEYER. *Kolloid-Z.* 30, 215-28(1922); cf. C. A. 14, 1478.—Colloidal Cu amalgams were prepd. in 3 ways: (1) by shaking colloidal solns. of Cu with metallic Hg, (2) by leaving colloidal solns. of Cu at rest in contact with metallic Hg and (3) by mixing colloidal solns. of Cu with colloidal solns. of Hg. The coagulated colloid formed by all of these methods contained Cu and Hg in equimol. quantities.

F. P. FLAGG

Some principles of the construction of unfired pressure vessels. S. W. MILLER. *Mech. Eng.* 44, 360-8(1922).—Fusion-welding, by oxyacetylene or metallic-electrode arc processes is superior to riveting or forge welding for joints in containers for gases and liquids. Rather than depend upon welding efficiency, i. e., ratio of strength of a weld to the strength of the material from which it is made, it is better either to make the weld so strong that rupture cannot occur there, or to use plate so weak that rupture will always occur there. Low-tensile plate, with max. of 0.15% C, 0.60 Mn, 0.05 S, 0.04 P, and 50,000 lbs. / sq. in. tensile strength, yield point at least 50% tensile strength, and elongation 1,500,000/tensile strength = % in 8 in., gives the best results. It must be free from non-metallic impurities. With steel proper annealing also is necessary. Better than ordinary welding wire (max. 0.06% C, 0.15 Mn, 0.03 P and 0.03 S) is Ni-steel wire with 0.15-0.25% C, 0.5-0.8 Mn, 0.045% S, 0.04 P, 3.25-3.75% Ni, as it gives 57,000-63,000 lbs. / sq. in. in the weld. The double "V" weld is superior to single "V" type, but more expensive. Scale must be cleaned carefully from the second side welded before welding, and during welding all foreign matter must be forced to the surface. Probably  $\frac{5}{8}$  in. is max. thickness for plate that should be used in making fusion-weld pressure vessels. It is possible commercially to reinforce a weld 16% on each side, and a reasonable reinforcement is recommended for safety. After welding a shell should be re-rolled, thus assuring freedom from flat spots at ends of plates welded, and relieving welding strains. In annealing after welding 900° F. (very dull red) is sufficient for relieving welding strains; for refining the grain critical temps. are so variable with different kinds of plate and welding wire, it is not feasible commercially to anneal for this purpose. Tests with welds in a Strohenger alternating bending-impact machine, giving 600 alternations per min., yielded results bearing out the conclusions given above. Appendices give data and illustrations of such tests.

W. C. BRAUGH

Welding through friction. M. VON SCHWARZ. *Z. Metallkunde* 12, 97(1920).—In boring a piece of cast Fe, a spiral borer of high-speed steel became jammed in a hollow space in the cast Fe. Two surfaces in the borer, of high-speed steel and of ingot, resp., became so firmly welded by the high friction that they could be broken apart only by the hammer.

C. C. DAVIS

Influence of protective colloids on the corrosion of metals (FRIEND, VALLANCE) 2.

Flotation separation of ores. L. BAILEY. U. S. 1,418,514, June 6. An aq. ore pulp is first subjected to aeration with air carrying oil vapor and then to aeration with air alone.

Leaching ores. W. SCHOPFER. U. S. 1,417,947, May 30. Ore is moved in one direction through a series of leaching vats and leaching liquid is surged from one vat to the next in the opposite direction.

Centrifugal apparatus (and mode of operating it) for ore flotation. W. H. PECK. U. S. 1,420,138-9, June 20.

**Apparatus for grinding, classifying and decanting ores.** J. R. BROADLEY. U. S. 1,418,523, June 6.

**Apparatus for amalgamating gold ores.** H. LOEVEN. U. S. 1,418,006, May 30.

**Treating ores containing iron and vanadium.** B. P. F. KJELLBERG. U. S. 1,419,971, June 20. Minerals contg. Fe and V, without Ti, are treated with  $\text{H}_2\text{SO}_4$ , the soln. thus obtained is evapd. to dryness and the residue from the evapn. is roasted to form insol. Fe oxides, from which the V is sepd. by extrn. with hot  $\text{H}_2\text{O}$  or other solvent. If Ti also is present in the starting material, Ti sulfates extd. are pptd. on heating the aq. soln.

**Vertical shaft furnace for smelting ores.** V. PAZOS y SACIO. U. S. 1,419,764, June 13.

**Extracting iron from ores.** A. J. MOXHAM. U. S. 1,420,127, June 20. Fe is reduced from oxide ore in a shaft furnace and is then purified electrolytically while the reduced material is in the form of fine particles in good conductive contact with each other.

**Extracting iron from its ores.** A. J. MOXHAM. U. S. 1,420,129, June 20. Fe is dissolved from its ores with HCl, the soln. is treated with  $\text{H}_2\text{SO}_4$  to liberate HCl and form  $\text{FeSO}_4$  and Fe is recovered from the soln. electrolytically.

**Extracting iron from its ores.** A. J. MOXHAM. U. S. 1,420,130, June 20. Fe is extd. from ore by the action of a solvent such as HCl or  $\text{H}_2\text{SO}_4$  and the pure Fe is recovered from the soln. electrolytically.

**Iron or steel from scrap metal.** L. P. BASSET. U. S. 1,419,801, June 13. Scrap Fe or steel is melted in a flame contg. a large % of CO and free  $\text{CO}_2$  and  $\text{H}_2\text{O}$  vapor, in order to produce Fe or steel directly on a hearth. Cf. C. A. 15, 1877.

**Tempering steel rails.** H. A. STOCK. U. S. 1,418,985, June 6. The rail head is subjected to brief close contact with the wall of a receptacle holding cooling liquid. U. S. 1,418,986 also relates to a method of regulating cooling of metal articles to temper them.

**Refining lead.** H. HARRIS. U. S. 1,418,148, May 30. See Can. 216,368 (C. A. 16, 1929).

**Annealing furnace adapted for treating metal articles.** G. W. and G. M. LANGE. U. S. 1,420,115, June 20.

**Galvanizing apparatus.** E. L. WATROUS. U. S. 1,418,412, June 6.

**Metal-etching composition.** H. C. GLOCKLER. U. S. 1,418,253, May 30. An etching compn. adapted for use on steel is formed from  $\text{CuSO}_4$  1, NaCl 1, vinegar 2 and  $\text{H}_2\text{O}$  1 oz.

**Blow-pipe adapted for brazing or welding metals.** A. E. KING. U. S. 1,420,107, June 20.

**Tungsten alloy.** C. A. LAISE. U. S. 1,418,081, May 30. An alloy adapted for the manuf. of elec. contact points is formed of W 87-98 and Mo 10-3 parts together with about 1 part or less of V.

**Aluminium alloy.** H. C. HALL. U. S. 1,418,303, June 6. An alloy which forms sound fine-grained castings is formed of Al together with Cu 1-3, Ti 1-2, Zn 6-16% and small amts. of such impurities as are usually present in com. Al.

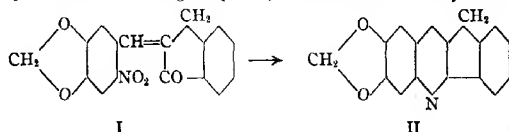
**Ingot mold.** E. GATHMANN. U. S. 1,419,454, June 13.

## 10—ORGANIC CHEMISTRY

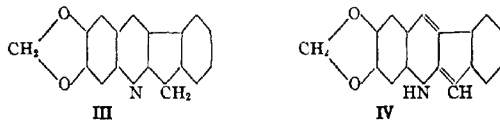
CHAS. A. ROUILLER

Dr. T. Sandmeyer. ALFR. CONZETTI. *Chem.-Ztg.* **46**, 549-50(1922).—Obituary. E. H.

**Polynuclear heterocyclic aromatic types. I. Some indenoquinoline derivatives.** J. W. ARMIT AND ROBT. ROBINSON. *J. Chem. Soc.* **121**, 827-39(1922).—Recent work indicates that many aromatic types as yet unknown should be capable of existence. It is proposed to survey the field of heterocyclic substances from this point of view. The present work concerns derivs. of pentamethine,  $(CH)_5$ , which, while it may not be capable of separate existence, may occur in fusion with other ring systems. *6'-Nitro-3',4'-methylenedioxy-2-benzylidene-1-hydrindone* (I), prepd. by passing dry HCl into  $\alpha$ -hydrindone (A) and nitropiperonal, in AcOH, yellow hexagonal prisms, m. 192°. The nitration of piperonylidenehydrindone led to a substance, yellow, hexagonal prisms, m. 167°, apparently a mixt. of mono- and di- $NO_2$  derivs. which was not changed by continued nitration. The *6'-amino derivative* (B) was obtained by condensing 6-amino-piperonal (C) and A with KOH, long, deep red needles, m. 227-8°; it may also be obtained by reducing I with  $Na_2S$ , but not conveniently. B, on boiling with glacial AcOH, is quickly and completely converted into *6,7-methylenedioxy-2,3-indeno-1,2-quinoline* (II), pale yellow needles or hexagonal prisms, m. 186° also obtained by reducing I with



Zn in boiling AcOH. *Hydrochloride*, pale yellow needles, decomp. 260°. *Mercuric chloride salt*, pale yellow needles, very slightly sol. The *methosulfate*, by the action of an excess of  $Me_2SO_4$ , forms pale yellow needles, m. 278.5° (decompn.). The aq. or alc. solns. exhibit striking violet fluorescence. The decompn. of the sulfate with alkali in  $H_2O$  resulted in the production of a green ppt. of ambiguous compn. C and  $\beta$ -hydrindone condense normally to form *6,7-methylenedioxy-2,3-indeno-2,1-quinoline* (III), pale yellow needles, m. 215.5°. It is believed that under appropriate conditions III can occur in the azonoid form (IV). Thus, when covered with glacial AcOH the compd. becomes pale brownish violet and the soln. dull mauve-red. On heating an intense brownish red soln. is obtained, which becomes brownish purple on cooling. Addition of a mineral acid produces a yellow, fluorescent soln.  $HCO_2H$  behaves similarly. The *hydro-*



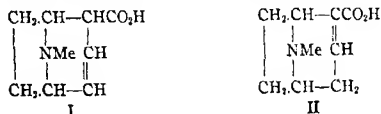
*chloride* of III forms pale yellow needles, exhibiting purple fluorescence in soln. The *methosulfate* (D) forms slender yellow needles, decomp. 257°. The *methochloride*, by the action of HCl, yellow, glistening needles, decomp. 195-235°. The action of KOH on D gives *anhydro-6,7-methylenedioxy-2,3-indeno-2,1-quinoline methohydroxide*, deep indigo, hexagonal prisms from  $Et_2O$ , m. 170°. Mineral acids give the corresponding metho-salts. Boiled with MeI, the *3-methylindeno chloride* is formed, light ochre-yellow rhombic microprisms, which, with NaOH, gave the corresponding *hydroxide*, purplish

black aggregates of rectangular prisms, decomp. 195°. An EtOAc soln. is deep red-purple and is decolorized by shaking with H<sub>2</sub>O, the aq. soln. exhibiting reddish violet fluorescence. 6,7-Methylenedioxy-2,3-[3-ketoindeno]-1,2-quinoline, by condensing C and 1,3-diketohydrindene, with AcOH, yellow needles, m. 242°. Glacial AcOH gives an intermediate product, deep blue with green reflex; this is dichroic in alc., thin layers being blue and thick ones red. Prolonged boiling with C<sub>6</sub>H<sub>6</sub> and excess of Me<sub>2</sub>SO<sub>4</sub> gave the *methosulfate*, intensely yellow rhombic prisms, m. 275° (decompn.). NaOH gives a crimson ppt., but the pure methohydroxide was not obtained. *Quindoline methosulfate*, long, orange-yellow needles, m. 242-5° (decompn.). The *methochloride* is bright canary-yellow, m. 273° (decompn.). The action of NaOH on the sulfate gives the compound, C<sub>14</sub>H<sub>14</sub>ON<sub>2</sub>, slender mauve threads, which may be the *methohydroxide*, or possibly di-[methylquindolyl]-acetone with 3 H<sub>2</sub>O. 2,3-Indeno-2,1-indole, by heating β-hydrindone phenylhydrazone with concd. HCl, hexagonal double pyramids, m. 212-5° (decompn.). 1-Methyl-2,3-indeno-1,2-indole, from α-hydrindone asym-phenylmethylhydrazone, plates, m. 153.5°. The 2,1-derivative forms rhombic prisms, m. 172°. C. J. WEST

Course of the quinaldine synthesis with 6-aminoquinolinetetrahydride and 6-aminokairoline. J. LINDER. *Monatsh.* 42, 421-38(1922).—6-Aminokairoline, C<sub>16</sub>H<sub>14</sub>N<sub>2</sub>, prepd. from nitrosokairoline by reduction with Sn and HCl, b<sub>11</sub> 163-5°, and quickly turns dark in the air. In the Skraup synthesis which followed 3 mols. aldehyde were used to 1 mol. of base without a special oxidizing agent, giving 3,7-dimethyl-7,8,9,10-tetrahydro-4,7-naphthosodiazine (A), C<sub>14</sub>H<sub>16</sub>N<sub>2</sub>, thick 4- and 6-sided rhombic plates, containing 1 H<sub>2</sub>O of crystn., m. 69°; anhydrous, m. 52°. It is easily purified through the PtCl<sub>4</sub> salt. The *monohydrochloride* is deep red and forms 6-sided plates which may be sublimed. The *dihydrochloride* forms colorless spears, which appear to hydrolyze to the mono salt with a little H<sub>2</sub>O. *Chloroplatinate*, yellow or reddish yellow powder with 1 H<sub>2</sub>O of crystn. Oxidation of A with K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> gave a very small yield of D. Reduction with HI and red P in a sealed tube gave 3-methyl-1,2,3,4,7,8,9,10-octahydro-4,7-naphthosodiazine (B), isolated as the *hydrochloride*, very hygroscopic crystals, sublines without m. The action of HI led to the formation of 3-methyl-7,8,9,10-tetrahydro-4,7-naphthosodiazine (C), poorly formed 6-sided rhomboids, containing 2.5 mols. H<sub>2</sub>O, m. about 70°. The *monohydrochloride* is red and the *dihydrochloride* colorless. Reduction with HI and red P gave B, though in certain expts. a *tetradecahydro derivative* was obtained and purified as the PtCl<sub>4</sub> salt. The oxidation of C with Hg(AcO)<sub>2</sub> gave 3-methyl-4,7-naphthosodiazine (D), thus establishing the constitution of A. 3-Methyl-4,7-naphthosodiazine (Willgerodt, *Ber.* 33, 2927) crystals with 4 mols. H<sub>2</sub>O, and m. anhydrous 115°. The same compd. has been isolated from the reaction products of 6-amino-1,2,3,4-tetrahydroquinoline.

C. J. WEST

**Ecgonine.** J. GADAMER AND C. JOHN. *Arch. Pharm.* 259, 227-40(1921); *J. Chem. Soc.* 122, I, 167.—Of the two formulas for anhydroecgonine,



Willstätter chose I (cf. *Ber.* 31, 2655), while G. and J. show that formula II must be the correct expression since the reduction to hydroecgonidine leads to the formation of 2 optical isomerides, thus indicating the creation of a third asym. C atom, which is only possible on the basis of I by assuming the occurrence of isomerization during the process of reduction. In the case of reduction *via* Willstätter with Na and AmOH, such isomerization is conceivable, but not at all probable if affected *via* Paal and Skita. In



both cases the same 2 isomerides of hydroecgonidine resulted, which were sepd. by their chloraurates. Further confirmation was found in the behavior of the Et esters of the chloraurates. Hydroecgonidine, when prep'd. by reducing anhydroecgonine-HBr, is identical with one of the isomerides obtained *via* Paal and Skita. Since anhydroecgonine according to II contains a conjugated system of double bonds, a rise in the mol. refraction was anticipated, as compared with hydroecgonidine. Detn. of the mol. refraction of the esters showed the expected rise in each case, although the Et ester of anhydroecgonine actually showed a depression when considered by itself, attributable doubtless to the pyrrolidine ring. The substances prep'd. during the investigation were: hydroecgonidine-HCl *via* Willstätter, m. 233-4°,  $[\alpha]_D -3.0^\circ$ , yields 2 chloraurates m. 210° and 230° resp., which on reversion to hydroecgonidine hydrochloride gave 2 corresponding isomerides each m. 233-4°, but having  $[\alpha]_D -2.77^\circ$  and  $-4.4^\circ$ , resp. The Paal-Skita method gave a product yielding 2 chloraurates, m. 210° and 220°, resp. (Et esters therefrom m. 173-4° and 123°, resp.) which on reversion gave 2 hydroecgonine hydrochlorides with  $[\alpha]_D -2.30^\circ$  and  $-1.24^\circ$ , resp. Anhydroecgonine-HBr with Zn and H<sub>2</sub>SO<sub>4</sub> gave a reduction product yielding only 1 chloraurate, m. 210°,  $[\alpha]_D 2.78^\circ$ . The Et ester from the *d*-chloraurate m. 173-4°, the ester-HCl having  $[\alpha]_D 5.1^\circ$ .

W. O. EMERY

**The quindolines.** E. GRANDMOUGIN. *Compt. rend.* 174, 1175-7 (1922).—PhNH<sub>2</sub> with indigo gives indigodiphenylimide (A), a weak base forming easily hydrolyzed salts. A heated with mineral acids isomerizes to 5-indoquinolinone anilide (B). Energetic hydrolysis of B gives PhNH<sub>2</sub> and *o*-aminobenzoyl-5-quindoline. *p*-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> with indigo by the same process gives on complete hydrolysis 5-methylquindoline, crystg. from EtOH in colorless needles, m. 251°. The Ac deriv., fine needles, m. 164-5°. The salts of these compds. are all intensely yellow to orange. Quindoline derivs. are frequently formed while working with indigo and isatin.

T. E. DUNLAP

**Reducing decomposition of apomorphine according to Emde.** FRANZ FALTIS and MATHILDE KRAUSZ. *Monatsh.* 42, 377-85 (1922).—Apomorphine-HCl is converted into the completely methylated product by treatment with Me<sub>2</sub>SO<sub>4</sub> and NaOH in a stream of H<sub>2</sub>, transformed into the chloride by pptn. with HgCl<sub>2</sub> in HCl, decomp'd. by H<sub>2</sub>S in aq. suspension, conc'd. to small vol. and treated with small portions of Na-Hg; the product, dihydromethylapomorphimethine, C<sub>18</sub>H<sub>28</sub>O<sub>2</sub>N, purified through the sulfate, forms transparent plates, m. 70.5-1.5°; the methiodide (A), long needles, m. 240°. Boiled with 30% NaOH for 0.5 hr., A gives dihydromethoxyvinylphenanthrene (B), C<sub>17</sub>H<sub>18</sub>O<sub>2</sub>, m. 84°. The methochloride, reduced with Na-Hg, gave a mixt. of B and the di-Et deriv., which were not sepd. Several analyses are given showing the use of Wijs's method for the detn. of olefinic double bonds in aromatic compds.

C. J. WEST

**Behavior of allyl- and benzylamine oxides towards sodium hydroxide.** JAKOB MEISENHEIMER, HELLMUTH GREESKE and AMALIE WILLMERSDORF. *Ber.* 55B, 512-32 (1922); cf. *C. A.* 14, 1539.—The object of this work was to det. how general is the rearrangement of PhMe(CH<sub>2</sub>CH:CH<sub>2</sub>)N:O under the influence of NaOH into PhNMeOCH<sub>2</sub>CH:CH<sub>2</sub>, described in the earlier paper. Replacement of the Me by other alkyls has no special influence on the rearrangement, but when the Ph group is replaced by an aliphatic residue the resulting dialkylallylamine oxides are extraordinarily stable towards alkalis and decomp. only gradually with formation of dialkylamines. The mobility of the allyl residue is retained when the double bond is replaced by a Ph group, PhMe(PhCH<sub>2</sub>)NO easily rearranging into PhNMeOCH<sub>2</sub>Ph. *Ethylallylphenylhydroxylammonium picrate*, obtained in 50-70% yield from PhNEtCH<sub>2</sub>CH:CH<sub>2</sub> and BzOH in cold C<sub>6</sub>H<sub>6</sub> and subsequent treatment with picric acid in C<sub>6</sub>H<sub>6</sub>, stout cryst. granules from alc., m. 120-2°. From 20 g. PhNEtCH<sub>2</sub>CH:CH<sub>2</sub>, oxidized at 25-30° with neutralized Caro acid (occasionally adding KOH to keep the soln. always very

faintly acid), then made distinctly alk. with NaOH, freed from impurities by extrn. with  $\text{Et}_2\text{O}$ , made strongly alk. with NaOH and distd. with steam, is obtained 13–5 g. *N*-ethyl-*O*-allyl-*N*-phenylhydroxylamine, light yellow oil of penetrating odor,  $b_{\text{D}}^{20}$  104°, darkens slowly on standing, resembles the Me homolog in its behavior but thus far it has not been possible to reduce the C:C union in the allyl residue, the substance being unchanged either by the Skita method or with Pd sponge.  $\text{Et}_2\text{NCH}_2\text{CH}(\text{CH}_3)_2$ , b. 110–1°, is obtained in 30% yield from 30 g. com.  $\text{NH}_4\text{Et}_3$  in 60 cc. abs. alc. slowly treated with 50 g.  $\text{CH}_2=\text{CHCH}_2\text{Br}$  and gently boiled several hrs. under a reflux; *picrate*, m. 94–5.5°, stout prisms from alc. *Diethylallylhydroxylammonium picrate*, obtained in 70% yield from the amine with a large excess of  $\text{H}_2\text{O}_2$ , fine slender needles from  $\text{H}_2\text{O}$ , flat stout prisms from alc., m. 138°. *Dimethylallylhydroxylammonium picrate*, obtained in 60% yield from the amine with  $\text{H}_2\text{O}_2$ , fine needles changing under  $\text{H}_2\text{O}$  into broad dark-yellow ribbon-shaped crystals, m. 136°.  $\text{PhNMeCH}_2\text{Ph}$ ,  $b_{\text{M}}$  187–8°, is obtained in 60% yield from  $\text{PhNHMe}$  and  $\text{PhCH}_2\text{Cl}$ ; *picrate*, needle-like prisms from alc., m. 127°; 10 g. of the base oxidized with Caro acid in  $\text{C}_6\text{H}_6$ , extd. from the  $\text{C}_6\text{H}_6$  with  $\text{H}_2\text{O}$ , freed from  $\text{C}_6\text{H}_6$  with  $\text{Et}_2\text{O}$  and pptd. with picric acid gives 4–5 g. *methylbenzylphenylhydroxylammonium picrate*, yellow prisms from alc., m. 130°; *hydrochloride*, needles, is unchanged in  $\text{H}_2\text{O}$  by NaOH at room temp. but on heating quickly rearranges into a yellow oil volatile with steam and distg. *in vacuo* without decompn.; not enough was available for prepn. in analytically pure form but its behavior leaves no doubt that it was *N*-methyl-*O*-benzyl-*N*-phenylhydroxylamine; it was insol. in dil. but sol. in cold concd. HCl, repptd. unchanged on immediate addition of  $\text{H}_2\text{O}$ , evolved the odor of BzH when boiled with concd. HCl, gave no cryst. *picrate*.

C. A. R.

**Propionic acid.** ANDRÉ DUBOSC. *Rev. prod. chim.* 24, 499–503(1921); 25, 37–42, 145–8, 223–4, 261–2, 297–8(1922).—Review of the chemistry of  $\text{EtCO}_2\text{H}$  and of its derivs.

A. P.-C.

**The hydrate of methylene oxide.** A. MAZZUCHELLI AND R. ARMENANTE. *Gazz. chim. ital.* 52, I, 338–46(1922).—In 1863 Wurtz found that ethylene oxide (A) gives a cryst. hydrate with  $\text{H}_2\text{O}$  that m. at low temps. (cf. also Paterno, *Gazz. chim. ital.* 49, 402(1919)); of this M. and A. undertook to det. the formula. Owing to the low m. p. and volatility of A and the lack of suitable analytical methods for A and  $\text{H}_2\text{O}$  thermal analysis was used to det. the compn. of this hydrate. It was necessary to prep. the entire series of  $\text{H}_2\text{O}$ -A mixts. Solns. of A in  $\text{H}_2\text{O}$  containing 2.03 to 5.41 mol. % A were prepd. by passing vapors of A into a known amt. of  $\text{H}_2\text{O}$  and detg. the A absorbed by weighing the closed receiver and contents. The f. p. of these solns. was detd. cryoscopically. By continuing the cooling after the sepn. of ice the eutectic was found to be  $-2.23^\circ$ , at which temp. a white compact solid seps. In 1 mixt. (8.63% A) with more than the eutectic concn. of A the hydrate of A sepd. which disappears on warming at  $0.7^\circ$ . For higher concns. of A it was necessary to use sealed tubes and since the hydrate of A shows marked supersatn. phenomena the less satisfactory m. p. of the hydrate had to be used instead of the f. p. For a mixt. with 2.62 mol. % A the m. p. was  $0.7^\circ$ , for 4.90%  $7.1^\circ$ , for 9.62%  $11.4^\circ$ , for 16.23%  $12.4^\circ$ , for 23.52%  $10.5^\circ$ , for 42.40%  $8.4^\circ$ , for 59.92%  $6.4^\circ$ , for 75.10% A  $4.7^\circ$ , resp. The appearance of the solid and the course of the curve indicate that at 75% no hydrate like  $3\text{C}_2\text{H}_4\text{O} \cdot \text{H}_2\text{O}$  exists. When the compn.-temp. diagram is prepd. the break in the curve occurs at about 13 mol. % A. The data are not sharp enough to det. whether  $\text{C}_2\text{H}_4\text{O} \cdot 6\text{H}_2\text{O}$  (14.29% A) or  $\text{C}_2\text{H}_4\text{O} \cdot 7\text{H}_2\text{O}$  (12.50% A) is the hydrate in question. More careful expts. at concns. between 5 and 8% failed to give more satisfactory results owing to insufficient equality in the bath temp. and the tube contents and to the excessive lag in the fusion of the hydrate. The desired data were obtained as follows: 2 mixts. contg. A in the proportion of 1:6 and 1:7  $\text{H}_2\text{O}$  resp., were inoculated and placed in water at

10.2–10.5°. The tube containing the 1:7 mixt. solidified to a transparent mass while the other showed excess liquid. From all the above it is concluded that the hydrate of A is  $C_2H_4O \cdot 7H_2O$ . The crystals formed are always large (even at  $-78^\circ$ ) so that the m. p. is really the dissolution point. Crystals formed at about  $10^\circ$  are several mm. in dimensions and probably of the triclinic system, while those formed by rapid cooling are needles arranged radially. A strong contraction in vol. occurs on melting which is a usual phenomenon with hydrates. This hydrate resembles those of  $CO_2$ ,  $SO_2$ ,  $Cl_2$ ,  $Br_2$ ,  $NO$ ,  $C_2H_2$ ,  $CH_4$ ,  $MeCl$ ,  $EtCl$ ,  $EtI$  and  $MeI$  in the large no. of  $H_2O$  mols. and in the volatility of the 2nd component, but differs in that A is sol. to an unlimited extent in  $H_2O$ .

E. J. WITZEMANN

The dioximes. II. G. PONZIO AND G. RUGGERI. *Gazz. chim. ital.* 52, I, 289–301 (1922).—The study of the  $\alpha$ -dioximes (C. A. 16, 908) was continued by studying methylacetylgluxime,  $MeC(:NOH)C(:NOH)Ac$  (A), which is of special interest for the soln. of the problem of the structure of the  $>C_2N_2O_4H_2$  group. According to the theories of Hantzsch and Werner (which P. and R. will show in this and other papers to be unsatisfactory) A is represented by 4 formulas (*anti*-, *syn*- and 2 *amphi*-forms) which, however, do not explain its behavior with  $N_2O_4$ . Although  $N_2O_4$  dehydrogenates the  $\alpha$ -dioximes  $RC(:NOH)C(:NOH)R'$ , giving peroxides (furoxans),  $RC_2N_2O_4R'$ , it converts A into  $MeC(:NOH)C(:N_2O_4)Ac$  (B), which proves that the 2 NOH groups are not equiv. since the  $\alpha$ -group remains unchanged while the  $\beta$ -group is transformed. Three formulas are possible for the  $N_2O_4$  group in B: (1) B is a  $\beta$ -nitrosnitro compd.,  $:C(NO)NO_2$ , derived from the nitrosooximic form of A,  $MeC(:NOH)CH(NO)Ac$ ; (2) B is the  $\beta$ -nitrite of the  $\alpha,\beta$ -dioxime,  $:C(NO)NO_2$ , derived from the  $\alpha,\beta$ -dioxime form of A; (3) B is a  $\beta$ -N- $NO_2$  deriv.,  $:C:N(:O)NO_2$ , derived from the  $\alpha$ -oximino- $\beta$ -nitronic form of A,  $MeC(:NOH):C[:N(:O)H]Ac$ . P. and R. consider that formula (1) is best. A treated with  $NH_3 \cdot H_2O$  gives  $MeC(:NOH)C(:NOH)NH_2$  (C) by being hydrolyzed first and then isomerizing. The interpretation of this reaction on the basis of formula (1) is given thus:  $(1) + H_2O \longrightarrow MeC(:NOH)CH(NO)NO_2$  (D) +  $AcOH$ ;  $D \longrightarrow MeC(:NOH)C(:NOH)NO_2$  (E);  $E + NH_3 \longrightarrow C + HNO_2$ . The reaction involved in forming D was previously observed with  $MeCH_2C(:N_2O_4)Ac$  (*Gazz. chim. ital.* 29, I, 358(1899)). The substitution of  $NO_2$  in E giving C is well known in the aromatic poly- $NO_2$  compds. and P. (C. A. 5, 1091) prepd.  $PhC(NH_2):NNHAr$  from  $PhC(NO_2):NNHAr$  with  $NH_3$ . Moreover C is identical with the product obtained from  $MeC(:NOH)C(:NOH)Cl + NH_3$  and therefore has the structure assigned to it. Owing to the fact that A gives a di-Ac deriv., an inner anhydride and a trioxime P. and R. consider it to be an equil. of 2 forms:  $MeC(:NOH)CH(NO)Ac$  (F)  $\rightleftharpoons$   $MeC(:NOH)C(:NOH)Ac$  (G). Of these F permits of interpreting the action of  $N_2O_4$  while G explains why  $Ac_2O$  can acetylate A in the cold, why A can lose  $H_2O$  to give methylacetyl furozan (H),  $MeC:N.O.N:C:Ac$ , and why  $NH_2OH$  can give a dimethyltriketone trioxime (I),  $MeC(:NOH)C(:NOH)C(:NOH)Me$ . The above interpretations depend on the migration of H represented thus:  $-C(:NOH)C(:NOH)-$  gives  $-C(:NOH)CH(NO)-$ . The same equil. may exist in  $Ac_2C:NOH$  thus:  $AcC(:NOH)Ac \rightleftharpoons AcCH(NO)Ac$  and can explain all the reactions of this compd. (Wolff, *Ann.* 325, 192(1902); Sachs, *Ablcsen, Ber.* 40, 671(1902)).  $Ac_2C:NOH$  with concd. solns. of  $NH_2OH.HCl + NaOAc$  sepd. some A on standing. The filtrate was neutralized with  $NaOH$  and extd. with  $Et_2O$ . The ext. was dried with  $Na_2SO_4$  and on evapn. gave A, m.  $141^\circ$  (decompn. sometimes). The aq. soln. of A does not attack Ni, Co, Cu or Fe nor react with their salts. A in  $Ac_2O$  gives the diacetyl derivative of A, white prisms, m.  $77-8^\circ$  (decompn.). A suspended in dry  $Et_2O$ , cooled with ice and treated with  $N_2O_4$  darkens and seps. B, white prisms from petroleum ether, m.  $102-3^\circ$  (decompn.). B was

added gradually to 6 N  $\text{NH}_4\text{OH}$  and after some hrs. was dild. and treated with 20%  $\text{Ni}(\text{OAc})_2$  which pptd. the *nickel salt* of C,  $(\text{C}_7\text{H}_7\text{O}_2\text{N}_3)_2\text{Ni}\cdot\text{H}_2\text{O}$ , orange-red laminas that do not lose their  $\text{H}_2\text{O}$  below  $130^\circ$ . This salt was suspended in  $\text{H}_2\text{O}$  and treated with  $\text{KCNO}$  until dissolved, the soln. was acidified with  $\text{AcOH}$  and some C sepd., white laminas or needles from  $\text{H}_2\text{O}$  or  $\text{Et}_2\text{O}$ , m.  $183-4^\circ$  (with partial sublimation). C attacks Ni slowly but not Co, Fe or Cu.  $\text{NaOH} + \text{BzCl}$  with C gave the *dibenzoyl derivative*  $\text{MeC}(\text{NOBz})\text{C}(\text{NOBz})\text{NH}_2$ , white needles, m.  $206^\circ$ . The  $\text{Et}_2\text{O}$  soln. of C with  $\text{HCl}$  in  $\text{Et}_2\text{O}$  gave the *hydrochloride* of C,  $\text{MeC}(\text{NOH})\text{C}(\text{NOH})\text{NH}_2\cdot\text{HCl}$ , as white prisms, m.  $170^\circ$  (decompn.). A heated cautiously in an oil bath gives H, b.  $154-5^\circ$ . It is best obtained by boiling 10 g. A few mins. with excess  $\text{Ac}_2\text{O} +$  fused  $\text{NaOAc}$ . The soln. was treated with  $\text{H}_2\text{O}$ , neutralized with  $\text{Na}_2\text{CO}_3$  and gave H on distn.; this was purified by distg. with steam. H with  $\text{KMnO}_4 + 50\%$   $\text{H}_2\text{SO}_4$  gives *methylfurazancarboxylic acid*, m.  $74^\circ$ . The *oxime* of H sepd. as white laminas, m.  $86^\circ$ ; the *acetyl derivative* of H sepd. as long white needles, m.  $60-1^\circ$ ; *benzoyl derivative*, white prisms from  $\text{EtOH}$ , m.  $120-1^\circ$ ; *hydrazone*, white prisms, m.  $120^\circ$ ; *phenylhydrazone*, needles, m.  $117^\circ$ ; *semicarbazone*, white prisms, m.  $232^\circ$ . A was heated in  $\text{H}_2\text{O}$  on the  $\text{H}_2\text{O}$  bath some hrs. with a slight excess of  $\text{NH}_4\text{OH} + \text{NaOAc}$ . The mixt. was then dild., treated with some  $\text{NaOAc}$  and 20%  $\text{Ni}(\text{OAc})_2$ . The Ni salt pptd. was washed with  $\text{H}_2\text{O}$ , dissolved in dil.  $\text{HCl}$ , reprecipd. with  $\text{NaOAc}$ , washed with  $\text{Me}_2\text{CO}$ , redissolved in  $\text{HCl}$  and extd. with  $\text{Et}_2\text{O}$ , from which I sepd. as white prisms, m.  $175^\circ$  (decompn.). Aq. solns. of I attack Ni, Co, Cu and Fe: it thus acts like the *syn-glyoxime* discussed in Paper I. The *nickel salt* of I,  $(\text{C}_7\text{H}_7\text{O}_2\text{N}_3)_2\text{Ni}$ , is derived from 2 mols. of I and seps. as an orange-yellow ppt., browns toward  $260^\circ$  without melting. The *tribenzoyl derivative* of I seps. as white prisms, m.  $191-2^\circ$ .

E. J. WITZEMANN

**Synthesis and properties of tetramethylenediguanidine.** A. KIESSEL. *Z. physiol. Chem.* 118, 277-83 (1922).—When putrescine is treated with cyanamide agmatine and tetramethylenediguanidine are formed. The latter has the formula  $[\text{CH}_2\text{CH}_2\text{NHC}(\text{NH})\text{NH}_2]_2$ . That the guanidine groups are arranged as shown is indicated by the failure to yield N with  $\text{HNO}_3$ . The sulfate crystals, from  $\text{H}_2\text{O}$  in spheres of short needles, sol. in 156.5 parts of  $\text{H}_2\text{O}$ , m.  $291^\circ$ . The carbonate is very slightly sol. in  $\text{H}_2\text{O}$ , insol. in alc.,  $\text{Et}_2\text{O}$ ,  $\text{Me}_2\text{CO}$  and  $\text{C}_6\text{H}_6$ . Pptd. from  $\text{H}_2\text{O}$  with alc.- $\text{Et}_2\text{O}$  the crystals are thick prisms. The hydrochloride is easily sol. in  $\text{H}_2\text{O}$ . The picrate is only slightly sol. (1 : 16,666), decomposes  $253-4^\circ$  with evolution of gas. The picrolonate is amorphous, decomposes  $278-9^\circ$ . The chloroaurate is very slightly sol. in  $\text{H}_2\text{O}$ ; it forms glistening needles which m. without decompn. at  $172.5^\circ$ . The chloroplatinate is slightly sol. in  $\text{H}_2\text{O}$  and by rapid heating decomposes at  $224^\circ$ . Tetramethylenediguanidine is pptd. quant. with a  $\text{Ag-baryta}$  mixt. and almost quant. with phosphotungstic acid.

R. L. STEHLE

**A possible asymmetry of aliphatic diazo compounds.** II. P. A. LEVENE AND L. A. MIKESKA. *J. Biol. Chem.* 52, 485-94 (1922); cf. C. A. 15, 1512.—*Diethyl diazo-succinate* was prepd. from di-Et aspartate.  $[\alpha]_D^{20}$  of different preps. varied from  $0.44^\circ$  to  $1.34^\circ$ . Hydrolysis yielded *diethyl malate* of greater optical activity than the diazo compd. used. Treatment with  $\text{HBr}$  yielded *diethyl bromosuccinate*, of theoretical Br content,  $[\alpha]_D^{20}$   $0.40^\circ$ , and treatment with  $\text{HCl}$  yielded an impure *diethyl chlorosuccinate*, which contained 15.35% Cl (calcd. 17.01) and which absorbed H, in presence of Pt black, indicating the presence of 10.23% diethyl fumarate. I. G.

**The coordination form of the glycerides.** J. KLIMONT. *Oesterr. Chem. Ztg.* 25, 63-4 (1922).—Differing from Grün (C. A. 16, 1744) K. considers that the glycerides show no phys. or chem. properties justifying their classification under the coordination theory as compds. of this form (cf. C. A. 16, 1396). C. C. DAVIS

**Bisulfite compounds of the isonitrosoketones and of glyoxime.** C. GASTALDI

AND G. BRAUNIZER. *Gazz. chim. ital.* 52, I, 307-16(1922).—In this paper results on the bisulfite compds. of  $\text{AcC}(\text{NOH})\text{Cl}$  (A) and of methylglyoxime are described.  $\text{NaHSO}_3$ , acting on A gives 2 compds., the 1st of which is either  $\text{AcCHCINHSO}_3\text{Na}\cdot\text{H}_2\text{O}$  (A') or  $\text{MeC}(\text{OH})(\text{OSO}_3\text{Na})\text{CCl}:\text{NOH}$  (A''). Owing to the fact that dil.  $\text{HCl}$  liberates the  $-\text{SO}_3\text{Na}$  group as  $\text{H}_2\text{SO}_3$ , which is characteristic of compds. of this type in which the  $-\text{SO}_3\text{Na}$  is bound to C, formula A' is preferred. The 2nd product (B) formed by further action of  $\text{NaHSO}_3$  could not be purified for analysis. Treating the  $\text{NaHSO}_3$  soln. with  $\text{EtOH}$  sepd. B as an oil that solidified. B in  $\text{AcOH}$  with  $\text{PhNHNH}_2$  gave 2-phenyl-1,3-dihydro-4-oxotriazolecarboxylic acid (C),  $\text{HO}_2\text{CC}:\text{CH}.\text{NH}.\text{NPh}.\text{NH}$ , which with  $\text{Na-Hg}$

gave  $\text{PhNHNHCH}\cdot\text{CO}_2\text{H}$ ,  $\text{NH}_3$  and  $\text{PhNH}_2$ , in which its behavior resembles that of 2-phenyl-4-oxotriazolecarboxylic acid (Pechmann, *Ann.* 262, 285(1891)). The isonitrosoketones  $\text{RCOC}(\text{NOH})\text{R}'$  (cf. *Gazz. chim. ital.* 51, I, 233(1921)) in general react with  $\text{NaHSO}_3$  so that  $\text{C}(\text{NOH})$  is 1st converted into  $\text{C}(\text{OSO}_3\text{Na})\text{NHOH}$ . This group reacts again with  $\text{NaHSO}_3$  giving  $\text{C}(\text{OSO}_3\text{Na})\text{NHSO}_3\text{Na} + \text{H}_2\text{O}$  probably, at least with  $\text{Me}_2\text{C}:\text{NOH}$ ,  $\text{MePhC}:\text{NOH}$  and A. It is well known that  $\text{C}:\text{N}$ .,  $\text{C}:\text{O}$  and  $\text{C}:\text{C}$ . compds. react in this way and  $\text{N}:\text{O}$  should now be added to the list:  $\text{N}:\text{O} + \text{HNaSO}_3 \rightarrow \text{N}(\text{OH})\text{SO}_3\text{Na}$ .  $\text{HNO}_2$  with  $\text{NaHSO}_3$  will give  $\text{HON}(\text{OH})\text{SO}_3\text{Na}$  and this with 1 or 2 more mols. will give  $\text{HON}(\text{SO}_3\text{Na})_2$  and the so-called nitrilesulfonic acid,  $\text{N}(\text{SO}_3\text{Na})_2$ , of Raschig. These reactions may also be conveniently interpreted by starting with the hydrates in each case, such as  $\text{N}(\text{OH})_2$ . 7 g. A were treated with 28 cc. 40%  $\text{NaHSO}_3$  satd. with  $\text{SO}_2$ , dissolved with warming and sepd. the bisulfite compound A', as small colorless rhombohedra, unstable in  $\text{H}_2\text{O}$  or in air. 20 g. A in 180 cc. 40%  $\text{NaHSO}_3$  satd. with  $\text{SO}_2$  sepd. A', which redissolved. After 24 hrs. 800 cc.  $\text{EtOH}$  were added which sepd. an oil that after some days gave a mixt. of crystals (B) that could not be sepd. 10 g. of B in 40 cc.  $\text{H}_2\text{O}$  were treated with 4 g.  $\text{PhNHNH}_2$  in 20 cc. glacial  $\text{AcOH}$  and after some hrs. sepd. C, colorless needles from  $\text{EtOH-H}_2\text{O}$  and then  $\text{C}_6\text{H}_6$ , m. 178-9° ( $\text{CO}_2$  evolution). With  $p\text{-BrC}_6\text{H}_4\text{NHNH}_2$  B gives the analogous compd.  $\text{C}_7\text{H}_5\text{O}_2\text{N}_2\text{Br}$ , as slightly yellow plates, m. 185° ( $\text{CO}_2$  evolution). 3 g. C in 40 cc.  $\text{H}_2\text{O}$ , a drop of 20%  $\text{NaOH}$  and 112 g. of 3%  $\text{Na-Hg}$  was decanted after 15 mins. and distd. with the steam. The distillate contained  $\text{PhNH}_2 + \text{NH}_3$  while the residue was  $\text{PhNHNHCH}_2\text{CO}_2\text{H}$ , colorless plates, m. 160°. Methylglyoxime (D) reacts with  $\text{Na}$  or  $\text{KHSO}_3$  giving  $\text{MeC}(\text{NHSO}_3\text{Na})(\text{OSO}_3\text{Na})\text{CH}:\text{NOH}$  (E) or the K salt. The formula was proved by analysis; by the transformation of E into the osazone of  $\text{AcCHO}$  by the action of  $\text{PhNHNH}_2$ ; and by the sapon. of E with dil. acids, giving  $\text{NaHSO}_3 + \text{NH}_2\text{SO}_3\text{Na} + \text{AcCH}:\text{NOH}$ . Of the two  $\text{C}:\text{NOH}$  groups in D only one reacts with bisulfites. The action of hydrolyzing agents on the bisulfite compds. of isonitrosoketones and of D consists in eliminating the  $\text{SO}_3\text{Na}$  group bound to C while the same group bound to N is eliminated as  $\text{H}_2\text{SO}_4$ . Thus  $\text{D} + \text{H}_2\text{O} \rightarrow \text{AcCH}:\text{NOH} + \text{NaHSO}_3 + \text{NaHSO}_4 + \text{NH}_3$ . These reactions are nearly quant., as was shown by detg. the  $\text{SO}_2$  iodometrically and the  $\text{H}_2\text{SO}_4$  gravimetrically. 2 g. finely powdered D with 15 cc. of a 40%  $\text{NaHSO}_3$  or  $\text{KHSO}_3$  satd. with  $\text{SO}_2$  were slowly dissolved. 80 cc.  $\text{EtOH}$  were added after 24 hrs. and E was 1st sepd. as an oil that solidified. It was filtered off, washed with  $\text{EtOH}$ , dried in air and dissolved in 40 cc.  $\text{H}_2\text{O}$  and sepd. again with  $\text{EtOH}$  as colorless needles. 3 g. B with 25 cc.  $\text{H}_2\text{O}$  and 6 g.  $\text{PhNH-NH}_2$  in 20 cc. glacial  $\text{AcOH}$  gave methylglyoxal osazone, m. 153-4°. 5 g. E in 40 cc. 10%  $\text{H}_2\text{SO}_4$  at 40-50° for 0.5 hr. was extd. with  $\text{Et}_2\text{O}$  and gave a small amt. of  $\text{Me}_2\text{C}:\text{NOH}$ , which characteristically was transformed into methylglyoxime, m. 157°.

E. J. WITZEMANN

Action of diazomethane upon ureides and uric acid. J. HERRIG. *Z. physiol. Chem.* 117, 13-27(1921).—1,3,4-Trimethylbarbituric acid, obtained by the action of  $\text{CH}_3\text{N}_2$  upon barbituric acid in  $\text{Et}_2\text{O}$ , m. 164-6°. With uric acid a tetramethyl deriva-

tive was obtained, m. 224–6°. With alloxan, diethyl-, ethylphenyl- and dipropylbarbituric acids well defined compds. could not be obtained. By the action of  $\text{Me}_2\text{SO}_4$  upon barbituric acid 1,3-dimethylbarbituric acid, m. 119–21°, was obtained. In the methylated compds. described it was not possible to det. the Me groups bound to N by the ordinary method.

R. L. STEHLÉ

New (observations) in the chemistry of the sugars. III. H. KILIANI. *Ber.* 55B, 493–505(1922); cf. *C. A.* 16, 2120.—I.  $\alpha$ -Galactanehexol diacid.—I-Mannohepturonic lactone allowed to stand 48 hrs. in a closed flask with 1 part  $\text{H}_2\text{O}$  and 1.2 times the calcd. amt. of 30% HCN and of 10%  $\text{NH}_3$  gives 60% of the amide ammonium salt,  $\text{C}_7\text{H}_{14}\text{O}_5\text{N}_2$ , of the above acid, becomes discolored about 180°, m. around 192° (decompn.), dissolves in much hot  $\text{H}_2\text{O}$  but with evolution of  $\text{NH}_3$ ; boiled 3 hrs. with the calcd. amt. of 0.5 N KOH, concd. to 0.25 the original vol. and allowed to stand 1 day it gives 75–80% of the dipotassium salt, microleaflets with 1  $\text{H}_2\text{O}$ , sol. in 10 parts hot  $\text{H}_2\text{O}$ , m. 201°; slightly above 100°; calcium salt, thick granular warts with 3.5  $\text{H}_2\text{O}$ ; zinc salt, spherical microaggregates with 2  $\text{H}_2\text{O}$ ; cadmium salt, granular crusts with 5  $\text{H}_2\text{O}$ ; lead salt, flocculent ppt. becoming granular in 2 days; diguinine salt, needles with 3  $\text{H}_2\text{O}$ , m. 201°; dibrucine salt, microneedles or pointed columns with 9  $\text{H}_2\text{O}$ , m. 170–1° (decompn.). The Ca salt shaken 1 hr. with  $\frac{1}{4}$  the calcd. amt. of 0.1 N  $(\text{CO}_2\text{H})_2$  yields the free acid, prismatic tablets with 2  $\text{H}_2\text{O}$ , sol. in about 70 parts hot  $\text{H}_2\text{O}$ , becomes discolored about 190°, apparently decomp. completely at 200°, converted by heating 5 min. in boiling  $\text{H}_2\text{O}$  with 0.2 part of 20% HCl and evapn. to dryness *in vacuo* over KOH into the dilactone; monolactone, best obtained from the Pb salt in  $\text{H}_2\text{O}$  with  $\text{H}_2\text{S}$  and subsequent evapn. at 60–70°, slender microprisms sol. in 15 parts hot  $\text{H}_2\text{O}$ ; dilactone, from the Ca salt in  $\text{H}_2\text{O}$  and 1.2 times the calcd. amt. of 20% HCl heated until dissolved and then concd. at 55° or from the K salt with HCl (yield, 93%), short prisms sol. in about 50 parts hot  $\text{H}_2\text{O}$ , does not react with Fehling soln. As the acid is optically inactive, it

must have the configuration

$$\begin{array}{ccccccc} & \text{H} & \text{H} & \text{OH} & \text{OH} & \text{H} & \text{H} \\ & | & | & | & | & | & | \\ \text{HO} & -\text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{CO}_2\text{H} \\ & | & | & | & | & | & | \\ & \text{OH} & \text{OH} & \text{H} & \text{H} & \text{OH} & \text{OH} \end{array}$$

*Bisphenylhydrazide*

of the dilactone, microleaflets, becomes discolored 250°, m. 285–6°. Boiled a long time with concd. HI, the acid gives chiefly an (apparently) amorphous acid with a C : C union, strongly reducing  $\text{KMnO}_4$  in soda. II. I-Mannohepturonic acid.—Phenylhydrazine, from the lactone in 10 parts  $\text{H}_2\text{O}$ , 4 mols.  $\text{PhNHNH}_2$  and an equal vol. of 50% AcOH allowed to stand 1 day, microleaflets from  $\text{C}_8\text{H}_8\text{N}_2\text{O} \cdot \text{MeOH} \cdot \text{H}_2\text{O}$ , m. 199°. If the aldehyde lactone with 4 mols.  $\text{PhNHNH}_2$  and an equal vol. of 50% AcOH is heated 4 hrs. under a reflux at 100°, the product is the phenylsuzone phenylhydrazide,  $\text{C}_{25}\text{H}_{24}\text{O}_6\text{N}_4$ , yellow needles from  $\text{C}_6\text{H}_5\text{N} \cdot \text{H}_2\text{O}$ , m. 203–4°; *p*-nitrophenylhydrazide, stout intensely yellow needles from  $\text{C}_6\text{H}_5\text{N} \cdot \text{C}_6\text{H}_5$ , m. 167° (decompn.); semicarbazone, flat microcrystals from  $\text{H}_2\text{O} \cdot \text{EtOH}$ , m. 174–5° (decompn.). Towards I-NaOH (Willstätter and Schudel, *C. A.* 13, 406), the acid behaves exactly like an aldose but the reaction is complete only after 1 hr. Judging from the behavior of ketorhammonic lactone (see paper II), however, ketones of the sugar group apparently behave in the same way if, besides the CHOH or C:O group, they contain an end Me group,  $\text{CHI}_3$  being formed. III. Lactone formation in polyhydroxy acids.—Attempts to convert  $\beta$ -galacteponic acid into its lactone by simple evapn. with dil. HCl or by boiling 3.5 hrs. under a reflux with 33 parts of 0.1 N HCl, evapn. and drying *in vacuo* over KOH failed (paper II), while the  $\alpha$ -acid forms the lactone spontaneously, and HCl converts the diacid described above (section I) and  $\delta$ -mannonic acid (Nef) into the lactones with surprising ease; *l*-gluconic acid (3.2 g.) likewise gives the lactone when evapd. to a thick sirup on the  $\text{H}_2\text{O}$  bath with 20 cc.  $\text{H}_2\text{O}$  and 3 drops of 20% HCl; while trihydroxyadipic (from metasac-

charin) and *d*-gluconic acids are unchanged by boiling 3 hrs. with 33 parts of 0.1 *N* HCl. *IV. β-Galacteponic acid + HNO<sub>3</sub>*.—The acid (not more than 12 g. at a time) treated with 1 cc. HNO<sub>3</sub> (d. 1.35) in 250–300 cc. cooling H<sub>2</sub>O per g. of the acid and allowed to stand 2.5 days gives 42% of *β*-galacteplanepentol diacid monolactone, C<sub>8</sub>H<sub>10</sub>O<sub>4</sub>, stout pointed columns with very strongly acid reaction, does not reduce Fehling soln., becomes discolored 145°, seps. on slow cooling of a hot moderately dil. soln. in flat stout columns, could not be converted into a dilactone. *Addendum*.—Bergmann having sent him the proofs of his paper on glucosose (C. A. 16, 2118), K. tested the sugar C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> obtained from meta- and parasaccharin for (a) the pine splinter reaction, (b) sensitiveness towards warm acids, and (c) the Fe-AcOH-H<sub>2</sub>SO<sub>4</sub> reaction. (a) and (b) are unmistakably positive; in (c) there is at once obtained a bluish green color which, however, is far less intense than that obtained with digitoxose. K. does not agree with B.'s new "definition of sugars," which lays too much stress on the ability to form osazones as the chief property of sugars. C. A. R.

**Xylan.** E. SALKOWSKI. *Z. physiol. Chem.* 117, 48–60 (1921).—With Fehling soln. and a pure 0.1% soln. of xylose it was found that 1 g. Cu corresponds to 0.5527 g. xylose. R. L. STEHLE

The action of some primary bases on 1,3,4,6-bromotrinitrobenzene. M. GRUA AND A. ANGELETTI. *Gazz. chim. ital.* 52, I, 316–22 (1922).—In a previous paper G. (C. A. 16, 66) described the prepn. of 1,3,4,6-C<sub>6</sub>H<sub>2</sub>Br(NO<sub>2</sub>)<sub>3</sub> (A) and now gives the results obtained by the action of primary bases upon it. Since A contains labile NO<sub>2</sub> in position 3 and the labile Br atom, 2 series of derivs. are possible: (1) A + 2 RNH<sub>2</sub> → RNH<sub>2</sub>·HNO<sub>2</sub> (ROH + N<sub>2</sub> + H<sub>2</sub>O) + C<sub>6</sub>H<sub>2</sub>Br(NO<sub>2</sub>)<sub>2</sub>NHR and (2) A + 4 RNH<sub>2</sub> → C<sub>6</sub>H<sub>2</sub>(NO<sub>2</sub>)<sub>2</sub>(NHR)<sub>2</sub> + RNH<sub>2</sub>·HBr + ROH + N<sub>2</sub> + H<sub>2</sub>O. Twelve primary bases were used. With 2 or 3 mols. of the base for 1 of A the reaction took place according to (1) and only with allylamine were 4 mols. used because the product from reaction (1) could not be purified. The labile NO<sub>2</sub> is 1st replaced and the Br atom only on prolonged heating with excess of the base. 3 g. A in 25 cc. EtOH + 1 g. anhydrous EtNH<sub>2</sub> at 0° sepd. 5-bromo-2,4-dinitroethylalanine, orange-yellow prisms, m. 105–6°. 5 g. A treated similarly with 5 cc. anhyd. allylamine with cooling sepd. 2,4-dinitrodiallyl-*m*-phenylenediamine, bright yellow needles, m. 139–40°. 3 g. A treated as above with 1.86 g. PhNH<sub>2</sub> sepd. 5,2,4-Br(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>2</sub>NHPh as a viscous mass that gave garnet-red prisms from EtOH + C<sub>6</sub>H<sub>6</sub>, m. 156°. With *m*-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> A gave 5-bromo-2,4-dinitro-3'-methylidiphenylamine, garnet-red crystals, m. 152°. With *p*-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> A gave 5-bromo-2,4-dinitro-4'-methylidiphenylamine as bright yellow prisms, m. 164–5°. A with *o*-HOC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> gave 5-bromo-2,4-dinitro-2'-hydroxydiphenylamine as red prisms, m. 203–4°. With *m*-HOC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> A gave 5-bromo-2,4-dinitro-3'-hydroxydiphenylamine as red prisms, m. 173–4°. *p*-HOC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> with A gave 5-bromo-2,4-dinitro-4'-hydroxydiphenylamine as garnet-red prisms, m. 215–6°. 2 g. A in 30 cc. EtOH heated 5–10 mins. with 1 g. *o*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H sepd. 5-bromo-2,4-dinitrodiphenylamine-2'-carboxylic acid, garnet-yellow prisms, m. 274–6°. A treated similarly with 1 g. *m*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H gave 5-bromo-2,4-dinitrodiphenylamine-3'-carboxylic acid, red-yellow needles, m. 245°. With *p*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H A gave 5-bromo-2,4-dinitrodiphenylamine-4'-carboxylic acid, red-yellow prisms, m. 247°. With *p*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>Ac A gave 5-bromo-2,4-dinitro-4'-acetyldiphenylamine as orange-yellow prisms, m. 167–8°. E. J. WITZEMANN

The action of some hydrazines and of pyridine on 1,3,4,6-bromotrinitrobenzene. MICHELE GRUA. *Gazz. chim. ital.* 52, I, 346–9 (1922).—In this paper the action of NH<sub>2</sub>NH<sub>2</sub>·H<sub>2</sub>O, PhNHNH<sub>2</sub>, PhNMeNH<sub>2</sub> and C<sub>6</sub>H<sub>5</sub>N on 1,3,4,6-BrC<sub>6</sub>H<sub>2</sub>(NO<sub>2</sub>)<sub>3</sub> (A), which contains a labile NO<sub>2</sub> group and Br, is described. The action of NH<sub>2</sub>NH<sub>2</sub>·H<sub>2</sub>O is of special interest. It reacts thus. (1) A + 2NH<sub>2</sub>NH<sub>2</sub> → C<sub>6</sub>H<sub>2</sub>(NO<sub>2</sub>)<sub>2</sub>BrNHNH<sub>2</sub> (B) + HN<sub>2</sub> + 2H<sub>2</sub>O; (2) B + HN<sub>2</sub> → C<sub>6</sub>H<sub>2</sub>(NO<sub>2</sub>)<sub>2</sub>(NHNH<sub>2</sub>)N<sub>2</sub> + HBr; (3) A +

$4\text{NH}_2\text{NH}_2 \longrightarrow \text{C}_6\text{H}_3(\text{NO}_2)_2(\text{NHNH}_2)_2(\text{C}) + \text{HN}_3 + 2\text{H}_2\text{O} + \text{NH}_2\text{NH}_2\cdot\text{HBr}$ . 3 g. A in 40 cc. abs. EtOH treated with 1.2 g. 98%  $\text{NH}_2\text{NH}_2\cdot\text{H}_2\text{O}$  gave 5-bromo-2,4-dinitrophenylhydrazine (B), as bright yellow needles, from  $\text{C}_6\text{H}_6 + \text{PhMe}$ , m. 203–4°. The part insol. in  $\text{C}_6\text{H}_6$  or PhMe was dinitrodihydrazinobenzene, m. 253° (decompn.) (Borsche, C. A. 15, 2843). B heated with EtOH + glacial AcOH gave 5-bromo-2,4-dinitroacetylphenylhydrazine, as orange-yellow prisms, m. 188–9°. 3 g. A with 2.16 g.  $\text{PhNHNH}_2$  in EtOH gave 5-bromo-2,4-dinitrohydrazobenzene as orange-yellow plates, m. 154–5°. A treated with  $\text{PhMeNNH}_2$  in EtOH gave 5-bromo-2,4-dinitromethylhydrazobenzene as red prisms, m. 138–9°. A heated on the  $\text{H}_2\text{O}$  bath with excess  $\text{C}_6\text{H}_5\text{N}$  sep'd. 3,4,6-trinitrophenylpyridinium bromide,  $\text{C}_{11}\text{H}_7\text{O}_4\text{N}_3\text{Br}$ , as golden yellow plates, m. above 300°.

R. J. WITZEMANN

**Mercurization in the aromatic series. I. Acetates and hydrates of phenolmercury and their derivatives.** E. MAMELI. *Gazz. chim. ital.* 52, I, 352–68(1922).—Mercurization, i. e., the direct substitution of H with  $\text{HgX}$  to give  $\text{RHgX}$ , is now a general reaction like nitration, thanks to the direct method introduced by Pesci (1892–1901), of obtaining  $\text{RHgOAc}$ , from which the other derivs. were then obtained. The no. of known monoacetate derivs. of the type  $\text{HOC}_6\text{H}_4\text{HgOAc}$  (A) is not large owing to the fact that (1)  $\text{PhOH} + \text{Hg}(\text{OAc})_2 \longrightarrow \text{HOC}_6\text{H}_4\text{HgOAc} + \text{AcOH}$  takes place best in the absence of solvents while (2)  $\text{PhOH} + 2\text{Hg}(\text{OAc})_2 \longrightarrow \text{HOC}_6\text{H}_3(\text{HgOAc})_2 + 2\text{AcOH}$  takes place in  $\text{H}_2\text{O}$ ,  $\text{H}_2\text{O-EtOH}$  and  $\text{H}_2\text{O-AcOH}$ , which are generally used. The disubstituted derivs. are insol. while the monosubstituted product is a sol. mixt. of *o*- and *p*-derivs. that is hard to sep. For this reason the latter are usually first converted into the less sol. chlorides. M. proposes to study these monosubstituted derivs. and in this 1st paper describes these derivs. of PhOH. In reviewing the earlier work on these compds. M. showed that A is unknown. He isolated the *o*- and *p*-isomers even when reaction (2) preponderates. The 7 kinds of solvents that have been used in the prepn. of these compds. were tried. The best yields of A were obtained when no solvent was used; not so good results with  $\text{H}_2\text{O-AcOH}$  and EtOH as solvents; even less with EtOH-AcOH,  $\text{H}_2\text{O-EtOH}$  or  $\text{H}_2\text{O}$ ; while scarcely any A was formed in AcOH. The position of the  $\text{HgOAc}$  group in the 2 isomers was det'd. by converting them into the corresponding chlorides,  $\text{HOC}_6\text{H}_4\text{HgCl}$ , of known constitution. The isomer of A that m. 157° is *o*-phenolmercuric acetate, since it gave the chloride that m. 156° and *o*- $\text{HOC}_6\text{H}_4\text{I}$  (B) that m. 43°. The other is the *p*-isomer, m. 165°, that gives a chloride m. 222°. Besides B M. obtained 2,4- $\text{I}_2\text{C}_6\text{H}_3\text{OH}$  and 2,4,6- $\text{I}_2\text{C}_6\text{H}_2\text{OH}$  by the action of  $\text{I}_2$  on A and the reaction is probably catalyzed by the Hg compd. From A M. prepd. 6 new salts of phenolmercury by treating the isomers of A with alk. salts. 25 g. powdered dry  $\text{Hg}(\text{OAc})_2$  were added in small portions in 15 mins. to 12 g. PhOH while heating on the  $\text{H}_2\text{O}$  bath. After 5 mins. more the mixt. was treated with 100 cc. boiling  $\text{H}_2\text{O}$ , heated until it was dissolved and filtered. On cooling a mixt. of the diacetate, A and free PhOH sep'd. This pasty ppt. was washed with PhMe (or petroleum ether or  $\text{CCl}_4$ ) to remove PhOH and became a powder. The mother liquor on concg. carefully gave A as well as the diacetate. On extg. this in a Soxhlet with Et<sub>2</sub>O most of the *o*- $\text{HOC}_6\text{H}_4\text{HgOAc}$  (C) was removed. Extn. with EtOH removed *p*- $\text{HOC}_6\text{H}_4\text{HgOAc}$  (D), leaving the diacetate (E) as a residue. C and D were purified by fractional crystn. from MeOH, EtOH, EtOAc or  $\text{C}_6\text{H}_6$ . In this way 30% C, 52% D and 15% E corresponding to 97% of the  $\text{Hg}(\text{OAc})_2$  used, was obtained. If 100 cc. 5% NaCl was added and the chlorides were worked up according to Whitmore and Middleton (C. A. 15, 1713) 32% of the *o*-chloride, 56% of the *p*-chloride and 10% of the dichloride, corresponding to 98% of the  $\text{Hg}(\text{OAc})_2$  used, was obtained. 100 g. HgO were dissolved in 800 cc. of a mixt. of 1000 cc.  $\text{H}_2\text{O}$  and 175 cc. AcOH. The soln. was filtered hot and added to 100 g. PhOH in 1300 cc. hot  $\text{H}_2\text{O}$  and heated on the  $\text{H}_2\text{O}$  bath until a test portion no longer gives a ppt. with NaOH.



With PhOH : HgO = 1 : 1 the main product was E. With a 2 : 1 ratio 30% C, 18% D and 40% E were formed corresponding to 88% of the HgO used. When pptd. with NaCl the results were 28% C, 14% D and 49% E. With 1 : 1 and NaCl pptn. the results were 13% C, 5% D and 70% E, corresponding to 88% of the HgO used. Increasing the duration of the heating increased the yield of C and D more than that of E. 18.8 g. PhOH in 240 cc. H<sub>2</sub>O mixed at 15° with 31.8 g. Hg(OAc)<sub>2</sub> in 130 cc. H<sub>2</sub>O + 1.5 cc. AcOH sepd. E after an hr. In such expts. in the cold 60-70% E, 5-10% D and 10-20% C were formed. C seps. from its EtOH solns. as white dendritic crystals that m. 157°, giving a turbid red liquid that clears and decomp. 210-5°. C is sol. in alkalis in which it gives the hydroxide (F), *o*-HOC<sub>6</sub>H<sub>4</sub>HgOH, which is converted into the internal oxide (G), C<sub>6</sub>H<sub>4</sub>O.Hg, by the action of CO<sub>2</sub>. C in aq. suspension is not acted

upon by H<sub>2</sub>S but in the presence of dil. or concd. HCl yellow then black HgS is pptd. C may also be obtained from E or G with AcOH. C treated in EtOH with alc. I<sub>2</sub> in small portions until the last was not decolorized was dild. with H<sub>2</sub>O the next day and distd. with steam; the *o*-IC<sub>6</sub>H<sub>4</sub>OH obtained m. 42-3°. 2,4-I<sub>2</sub>C<sub>6</sub>H<sub>3</sub>OH, m. 72-3°, and 2,4,6-I<sub>3</sub>C<sub>6</sub>H<sub>2</sub>OH, m. 160°, were also sepd. D gave long fine needles, m. 165°, decomp. 210-5°, with the formation of a Hg sublimate as with C. It is in general less sol. than C. With alkalis, CO<sub>2</sub>, and H<sub>2</sub>S it behaves like C. *o*-HOC<sub>6</sub>H<sub>4</sub>HgCl was pptd. from solns. of C with NaCl and m. 156°, decomp. 175-85°. *p*-HOC<sub>6</sub>H<sub>4</sub>HgCl obtained similarly from D, m. 222°, giving a liquid that solidifies 230-5°. Solns. of the reaction product (A) treated with KBr solns. ppt. mixts. of the bromides. On extg. this ppt. with EtOH in a Soxhlet the 2 mono-Br derivs. were removed and on cooling the soln. seps. most of the *p*-phenolmercuric bromide as a white powder or scales, m. 144-6° (decompn.). The *o*-isomer seps. as fine silky needles, m. 130-2°, on cooling the aq. soln. KI acting on the aq. soln. of C sepd. *o*-phenolmercuric iodide (H) as white prisms, m. 121°, decomp. 200-10°. The *p*-isomer is a white powder, m. 134-5°, decomp. 200-10°. Solns. of C with KNO<sub>3</sub> gave *o*-phenolmercuric nitrate as infusible white crystals that blacken with decompn. at 200°. The *p*-isomer is a white cryst. infusible substance that darkens at 210°. C with K<sub>2</sub>SO<sub>4</sub> gives *o*-phenolmercuric sulfate, (HOC<sub>6</sub>H<sub>4</sub>Hg)<sub>2</sub>SO<sub>4</sub>, as a white infusible powder. The *p*-isomer is a white infusible substance. Dissolving C or H in 10% NaOH and then allowing the soln. to evap. gave *o*-phenolmercuric hydroxide, HOC<sub>6</sub>H<sub>4</sub>HgOH, as an infusible white powder that blackens. The *p*-isomer is similar.

E. J. WITZEMANN

Personal remarks (regarding the tautomerism of resorcinol). W. FUCHS. *Ber.* 55B, 491-2(1921).—Answer to Herzig and Zeisel (*C. A.* 15, 3639). C. A. R.

Reactivity of the nitrobenzaldehydes. GUSTAV HELLER, HILDE LAUTH AND ARNOLD BUCHWALDT. *Ber.* 55B, 483-9(1922).—Baeyer and Drewson (*Ber.* 15, 2882 (1882)) found that *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO condenses easily with AcCO<sub>2</sub>H under the influence of HCl gas, forming *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CH:CHCOCO<sub>2</sub>H (A), while the isomeric *m*- and *p*-acids could not be obtained. This is not due to the *o*-aldehyde being in general more reactive than its isomers, for the literature and some condensations described in the present paper indicate that all 3 isomers as a rule react with equal ease. In A, therefore, the NO<sub>2</sub> group must stand in some closer relation to the *o*-side chain, a relation which cannot well be represented by formulas, and it is the double influence of the CHO and the NO<sub>2</sub> groups which facilitates the condensation to A. *α*-Methyl-*p*-nitrocinnamic aldehyde, obtained in 25% yield from *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO and EtCHO in cold alc. slowly treated with 5% NaOH and allowed to stand 24 hrs., long faintly yellow needles from ligroin, m. 112-3°, reduces NH<sub>4</sub>-AgNO<sub>3</sub> with mirror formation. *m*-Nitro isomer (yield, 30%), m. 83°. *o*-Nitro-*ω*-dichlorobenzalacetone, from *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO and Cl<sub>2</sub>CHCOME in alc. with NaOH, prisms from C<sub>6</sub>H<sub>6</sub>, m. 106-7°; *p*-isomer, prisms from Et<sub>2</sub>O or C<sub>6</sub>H<sub>6</sub>.

m. 125° (yield, 30%); *m*-isomer, m. 116–7°. *Ethyl α-p-nitrobenzalacetate*, obtained in 60% yield from  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$  and  $\text{AcCH}_2\text{CO}_2\text{Et}$  in alc. and a few drops piperidine at 30–5°, needles from alc., m. 164°; the *o*-isomer could not be obtained. *cryst. α-Methyl-o-nitrocinnamyl methyl ketone*, from  $o\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$  in 80%  $\text{H}_2\text{SO}_4$  allowed to stand 12 hrs. with  $\text{MeCOEt}$ , faintly yellow needles from 66% alc., m. 62–3°, gives in ice-cold alc. with concd.  $\text{HCl}$  and  $\text{Zn}$  dust a *zinc chloride salt*, crystals from dil.  $\text{HCl}$ , m. 238° (decompn.), of the *amino ketone*, long silky hydrated needles m. 82° (anhydrous, 124° (decompn.)), easily sol. in moderately dil.  $\text{HCl}$ , whose *benzoyl derivative*, long needles from 50% alc., m. 86°. If the reduction is effected with only  $\text{H}_2\text{O}$  as the cooling agent, the product is  $\alpha,\beta$ -dimethylquinoline, b. 270–80°, m. 68°, which cannot be obtained from the  $\text{NH}_2$  ketone by heating with  $\text{H}_2\text{O}$  or dil. acids. *α-Methyl-p-nitrocinnamyl methyl ketone*, fine light yellow needles from  $\text{C}_6\text{H}_6$ , m. 95–6°; *amino ketone*, from the  $\text{NO}_2$  compd. in alc. with  $\text{SnCl}_2$  and concd.  $\text{HCl}$ , light yellow prisms from  $\text{C}_6\text{H}_6$ , m. 120°, easily sol. in dil. acids. *m-Nitro ketone*, m. 78°. C. A. R.

*Action of light on the cinnamic acids and the constitution of the truxillic acids.* A. W. K. DE JONG. *Ber.* 55B, 463–74(1922).—Stobbe (*C. A.* 13, 3190) and Störmer (*C. A.* 15, 1888) did not take into consideration de J.'s investigations on this subject, the results of which have been published briefly from time to time in *Verslag Akad. Wetenschappen* (20, 55(1911); 23, 1255(1915); 24, 264, 568(1915); 26, 543, 906, 1158, (1918); 27, 1219(1919); cf. *C. A.* 6, 2746; 9, 2088; 10, 3069; 12, 1385, 2549; 13, 314, 1460, 3149). Possibly this is due to the fact that these papers have not been abstracted in *Chem. Zentr.* during 1916–18, and de J. now republishes his results in somewhat more detailed form. He has found that insolation of *allo*-cinnamic acid (A) (as obtained by quickly evap. solns. of the acid in a little alc. or  $\text{CHCl}_3$ ) gives  $\beta$ -but no  $\alpha$ -truxillic acid; liquefaction of the A (by not providing for its cooling during the insolation), covering with a glass plate or exposing to the light in the shade instead of in direct sunlight, decreases the yield of truxillic acid. Increasing the surface of the exposed A favors the formation of the truxillic acid, as does mixing of the A with *trans*-cinnamic acid (B), while mixing with  $\text{BzOH}$ ,  $\beta$ - or  $\alpha$ -truxillic acid diminishes the yield of the  $\beta$ -truxillic acid. Expts. with A, B and mixts. of A + B showed that B can yield  $\alpha$ - and  $\beta$ -truxillic acids; that the formation of the  $\beta$ -acid from A occurs indirectly through B; and that the  $\beta$ -acid, contrary to the opinion expressed in 1912, is not formed by a union of 1 mol. each of A and B. The different forms of A all behave in the same way on insolation, giving  $\beta$ -, together with small amts. of  $\alpha$ -truxillic acid; the same is true of the double acid from A and B. If B, during its insolation, is dissolved and recrystd. from time to time, it gives decreasing amts. of  $\alpha$ - and increasing amts. of  $\beta$ -truxillic acid. If a satd. alc. soln. of B is dild. with an equal vol. of alc. and quickly evapd. on glass plates, the resulting cauliflower-like aggregates of needles, if insulated directly, give only  $\beta$ -truxillic acid, but if the crystals are introduced into a satd. alc. soln. of B they completely disappear in 1–1.5 hrs. and are replaced by small thicker crystals giving  $\alpha$ -truxillic acid on insolation; the original needles are therefore a metastable form (C) of B, already described by Erlenmeyer, although his method of prepn. is not reliable, nor is his statement correct that B changes above its m. p. into C. C can, however, be obtained easily and in large amt. by pouring an alc. soln. of B, nearly satd. at room temp., with stirring into much  $\text{H}_2\text{O}$  or by adding  $\text{HCl}$  to B in  $\text{NH}_4\text{OH}$ . Red, yellow or green light cannot convert A, B or C into truxillic acids. C. A. R.

*Theory of carbonium compounds.* F. KEHRMANN. *Ber.* 55B, 507–11(1922).—Answer to Hantzsch (*C. A.* 16, 1414). C. A. R.

*Onium salts of the azo compounds. I (Preliminary communication).* F. KEHRMANN AND R. VAN DER LAAR. *Ber.* 55B, 511–2(1922).—K. and v. d. L. have apparently succeeded in adding alkyl halides and  $\text{Me}_2\text{SO}_4$  to the unsatd. N of the azo group with

formation of true azonium compds. Thus, when  $(p\text{-MeOC}_6\text{H}_4\text{N})_2$  is heated several hrs. at  $55\text{--}60^\circ$  with a considerable excess of freshly purified acid-free  $\text{Me}_2\text{SO}$ , there is obtained a dark red melt from which violet crystals slowly sep. As soon as the melt no longer changes in appearance it is repeatedly extd. with not too much cold  $\text{H}_2\text{O}$ ;  $\text{HClO}_4$  ppts. from the intensely orange-red soln. the violet perchlorate,  $\text{MeOC}_6\text{H}_4\text{NMe}(\text{ClO}_4) \cdot \text{NC}_6\text{H}_4\text{OMe}$ , salted out by  $\text{HClO}_4$  from  $\text{H}_2\text{O}$  at  $60\text{--}70^\circ$  in dark red leaves with violet metallic luster, sol. in hot  $\text{H}_2\text{O}$  with yellowish red color and apparently entirely without hydrolysis, gives with  $\text{H}_2\text{PtCl}_6$  the normal chloroplatinate,  $(\text{C}_6\text{H}_7\text{O}_2\text{N}_2\text{Cl})_2\text{PtCl}_6$ , brick-red cryst. powder.  $(p\text{-EtOC}_6\text{H}_4\text{N})_2$  forms entirely analogous salts. C. A. R.

The so-called di-(9,10-monohydroxyphenanthryl)amine proposed as a reagent for nitric acid and phenanthroxazine. B. FORESTI. *Gazz. chim. ital.* 52, I, 278-85 (1922).—Schmidt and Lumpf (C. A. 4, 1742) treated 9,10-dihydroxyphenanthrene with concd. aq.  $\text{NH}_3$  and obtained di-9,10-monohydroxyphenanthrylamine (A), m.  $385^\circ$ , gives in concd.  $\text{H}_2\text{SO}_4$  a blue color which changes variously with oxidizing agents. The test is especially sensitive for nitrates and S. and L. propose the use of a soln. of 0.01 g. A in 100 cc.  $\text{H}_2\text{SO}_4$  as a reagent for  $\text{HNO}_3$ . Bamberger and Grob (*Ber.* 34, 533(1901)) obtained phenanthroxazine (B), m.  $350\text{--}5^\circ$ , from phenanthrenequinone +  $\text{PhNHNH}_2$ , which gives a violet soln. in concd.  $\text{H}_2\text{SO}_4$ . Its behavior with  $\text{HNO}_3$  resembles that of A. In fact its behavior is so similar as to suggest that A may be a mixt. containing B. B was prepd. and its m. p. was found to rise as the initial temp. at which heating is begun was raised and as the period of heating was shortened. F. took the temp. at which it melted when heated 6 mins. (i. e.,  $422^\circ$ ) as the m. p. of B and used the same method throughout this paper. Solns. of A and B in  $\text{H}_2\text{SO}_4$  contg.  $\text{HNO}_3$  are not alike; the color with B is more violet. Phenanthrenequinol treated with  $\text{NH}_3$  gas in cumene soln. (*Ber.* 34, 533(1901)) gives a mixt. of B and phenanthrazine (C). Mixts. of B and C were prepd. on the supposition that A is a mixt. of B and C. With 80% B and 20% C the color reaction of A was matched. S. and L. did not purify A. When A was washed and extd. with  $\text{EtOH}$  its m. p. and compn. tended to approach that of B and when crystd. it m.  $433^\circ$  and some crystals resembling those of B mixed with yellow-green crystals were obtained. The color reaction now resembled that of equal parts of B and C. The sepn. having failed, F. traced the m. p. curve for mixts. of B (m.  $422^\circ$ ) and C (m.  $440^\circ$ ) and found it to be approx. a straight line. From all the evidence given F. concludes that A is a mixt. of B and C and that its characteristic reaction with  $\text{HNO}_3$  is due to B. F. compared the test with B for  $\text{HNO}_3$  with the most sensitive test known (the brucine test) and found it to be almost as sensitive. While brucine reacts with both  $\text{HNO}_3$  and  $\text{HNO}_2$  B is specific for the former. The test for  $\text{HNO}_3$  is effective in the presence of 27 parts  $\text{HClO}_3$  or 13 parts  $\text{CrO}_3$ . B as a reagent has the advantage of being really specific for  $\text{HNO}_3$ . The colored substance is probably a  $\text{NO}_2$  deriv. of B. If it were a product of oxidation other oxidizing acids like  $\text{HNO}_2$  would very likely give the color. This is true in the case of brucine (Leuchs, Geiger, C. A. 4, 168) in which a quinonoid compd. is formed. E. J. WITZEMANN

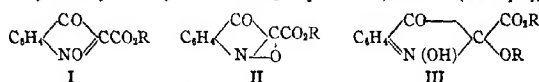
Amino- and anilinophenanthrenequinones. KURT BRASS AND ERWIN FERBER. *Ber.* 55B, 541-56(1922); cf. C. A. 14, 3070.—2-Bromophenanthrenequinone (A), treated with  $\text{PhNH}_2$ ,  $\text{PhNH}_2\text{HCl}$  or  $2\text{PhNH}_2\text{H}_2\text{SO}_4$  under ordinary conditions, under pressure or in  $\text{PhNO}_2$  as a diluent, does not react with elimination of  $\text{HBr}$ , but the A acts as an oxidizing agent and the resulting dark blue to black products are substances closely related to aniline black. If they are freed from the excess of  $\text{PhNH}_2$  and the unchanged A is removed with alk.  $\text{Na}_2\text{S}_2\text{O}_4$ , they can easily be oxidized to benzoquinone with  $\text{CrO}_3$ ; the 2-bromophenanthrenequinol (B) formed simultaneously, however, also reacts with any  $\text{PhNH}_2$  still present with the formation of phenylaminohydroxyphenanthrene. The same results are obtained when  $\text{AcNHPh}$  or its Na salt or the Na

or Al salts of  $\text{PhNH}_2$  are used instead of  $\text{PhNH}_2$ . The monophenylhydrazone of **A** does not react with  $\text{PhNH}_2$  in the desired sense, nor does the dibenzoate of **B**. Recourse was then had to the phenylation of aminophenanthrenequinones. 2- and 4-Nitrophenanthrenequinones are obtained in 20 and 13 g. yields, resp., by nitration of 30 g. phenanthrenequinone. The 2- $\text{NO}_2$  compd. (5 g.), rubbed to a thin paste with 250 cc.  $\text{NaOH}$  (d. 1.065), slowly treated with somewhat more than 4 mols. solid  $\text{Na}_2\text{S}_2\text{O}_4$ , warmed a short time at  $50^\circ$ , dild., filtered and treated with air, gives 3.6 g. of the 2- $\text{NH}_2$  compd. (**C**), also obtained in 3.9 g. yield from 5 g. of the  $\text{NO}_2$  compd. in much  $\text{H}_2\text{O}$  quickly treated with a soln. of  $\text{NaSH}$  prepd. from 1.6 g.  $\text{NaOH}$ , shaken 0.5 hr. in a tightly stoppered flask, dild. and treated with air; it seps. from  $\text{H}_2\text{O}$  in slender black-violet needles, brown in transmitted light, sinters  $205\text{--}10^\circ$ , gradually softens but does not m. clear  $300^\circ$ , sol. in concd.  $\text{H}_2\text{SO}_4$  with red-brown, in  $\text{H}_2\text{SO}_4$  dild. with 0.25 part  $\text{H}_2\text{O}$  with cress-red, in fuming acid (20%  $\text{SO}_3$ ) with green color; *acetyl derivative* (**D**), obtained with  $\text{Ac}_2\text{O}$  in boiling  $\text{AcOH}$ , red-violet needles from the red-brown soln. in  $\text{PhNO}_2$ , m.  $324^\circ$  (decompn.), sol. in concd.  $\text{H}_2\text{SO}_4$  with brown, in  $\text{H}_2\text{SO}_4\text{--H}_2\text{O}$  (4 : 1) with red-brown, in fuming acid with green color, easily forms a yellow vat from which it is reprecipitated unchanged (passing through green) by air, dyes cotton a dirty salmon-red; *benzoyl derivative*, prepd. with  $\text{BzCl}$  in hot  $\text{C}_6\text{H}_5\text{N}$ , flat brown-red spears from  $\text{PhNO}_2$ , m.  $297\text{--}8^\circ$ , sol. in  $\text{H}_2\text{SO}_4$  with green-brown color, forms a deep-yellow vat which dyes cotton a turbid light red. 2-Acetylamino-*o,o'*-diacetylphenanthrenequinol, from **C** in a little  $\text{AcOH}$  heated a short time with excess of  $\text{Ac}_2\text{O}$  and then boiled about 0.5 hr. with Fe filings, fine white needles from  $\text{EtOH--H}_2\text{O}$ , m.  $228^\circ$ , subliming in silky needles, gradually dissolves in concd.  $\text{H}_2\text{SO}_4$  with green color. 4-Aminophenanthrenequinone, obtained almost quant. from the  $\text{NO}_2$  compd. with  $\text{NaSH}$  and subsequent treatment with air, violet-brown crystal meal with metallic luster from  $\text{H}_2\text{O}$ , black warty aggregates from 96% alc., softens  $207^\circ$ , does not m.  $340^\circ$ , easily sol. in the usual solvents with intense red, in concd.  $\text{H}_2\text{SO}_4$  with yellow-olive, in more dil. acid (4 : 1) with red-brown color. 2-Ethylaminophenanthrenequinone, from 1.7 g. **D** and 0.9 g.  $\text{EtBr}$  heated 5.5 hrs. at  $180^\circ$  in  $\text{C}_6\text{H}_5\text{N}$  in a sealed tube, poured into much dil.  $\text{HCl}$ , filtered and deacetylated by boiling 1.5 hrs. with 1 : 1  $\text{H}_3\text{PO}_4$ , violet-black powder, sol. in hot  $\text{AcOH}$ ,  $\text{PhNO}_2$  and  $\text{C}_6\text{H}_5\text{N}$  with brown color, seps. from  $\text{PhNO}_2$  in cryst. warts, has no m. p. 2-Anilinophenanthrenequinone, from equimol. amts. of **C** and  $\text{PhBr}$ , with a little Cu powder, heated 4 hrs. at  $200^\circ$  in  $\text{C}_6\text{H}_5\text{N}$ , black, almost insol. powder, sol. in cold concd.  $\text{H}_2\text{SO}_4$  with dirty brown color, forms a vat with very great difficulty in aq., easily in aq. alc. suspension, has no m. p., is almost insol. in aq. or alc.  $\text{KOH}$ . 2',4'-Dinitro-2-anilinophenanthrenequinone, obtained (together with some  $[(\text{O}_2\text{N})_2\text{C}_6\text{H}_3]_n$ , m.  $143^\circ$ ) from 1 mol. each of **C** and 2,4-( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_3\text{Cl}$ , with a little  $\text{CaCO}_3$  and Cu powder boiled 1.5 hrs. in  $\text{PhNO}_2$ , brown spear- and table-like crystals from  $\text{PhNO}_2$ , m.  $280^\circ$ , sol. in concd.  $\text{H}_2\text{SO}_4$  with brown color, forms a vat in alk.  $\text{Na}_2\text{S}_2\text{O}_4$  does not react with *o*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ , forms in cold aq. alc.  $\text{KOH}$  a salt recognized by the intense red color imparted to the soln., gives 2,4-( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_3\text{OH}$  with  $\text{K}_2\text{Cr}_2\text{O}_7\text{--H}_2\text{SO}_4$  (no diphenic acid could be detected); 1 g. heated 1 hr. at  $80^\circ$  with 100 cc. of 10%  $\text{KOH}$  gives 2',4'-dinitro-2-anilindiphenylethylglycolic acid, brown amorphous powder, has no m. p., sol. in concd.  $\text{H}_2\text{SO}_4$  with red-brown color, forms easily sol. alkali and insol. Pb, Cu and Ag salts. 2',4',6'-Trinitro-2-anilinophenanthrenequinone, from **C** and 1 mol. picryl chloride, with a little  $\text{NaOAc}$  and a trace of Cu powder, refluxed 3 hrs. in alc., sandy powder of small red-brown table-like crystals or a red to red-brown amorphous powder, m.  $304\text{--}5^\circ$ , sol. in concd.  $\text{H}_2\text{SO}_4$  with yellow-green color, reprecipitated unchanged by  $\text{H}_2\text{O}$ , forms a vat with alk.  $\text{Na}_2\text{S}_2\text{O}_4$  but gives no quinaxaline with *o*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ , oxidized by  $\text{K}_2\text{Cr}_2\text{O}_7\text{--H}_2\text{SO}_4$  to picramide, gives with aq.  $\text{KOH}$  2',4',6'-trinitro-2-anilindiphenylethylglycolic acid, does not m., decomp.  $300^\circ$  (heated in larger amts. in an open test-tube it deflagrates explosively at  $160^\circ$ ).

C. A. R.

A new class of colored reduction products from 1-benzoylanthraquinones or 2,3-phthaloylbenzophenones. II. ALFRED SCHAARSCHMIDT. *Ber.* 55B, 489(1922).—As expressly stated in his papers (*C. A.* 9, 2256; 10, 1193), the formulations suggested by S. for his peculiar reduction products were only provisional; before expressing any opinion regarding Scholl's theory (*C. A.* 16, 1243) he will await the latter's promised further evidence. C. A. R.

The isotogens. GUSTAV HELLER AND WERNER BOESSNECK. *Ber.* 55B, 474-82 (1922).—Ruggli found (*C. A.* 13, 473) that isotogenic esters (I) are converted by alc. HCl into light yellow substances which no longer have quinoid properties and form oximes; he believed that they were isomers (II) of I. A repetition of his work, however, has shown that they are alc. addition products, *N*-hydroxy- $\alpha$ -alkoxy- $\alpha$ -carboalkoxy- $\beta$ -ketodihydroindoles (III); they are easily acetylated or benzoylated in  $C_6H_5N$ , are reduced by Zn dust and AcOH to indoxyl esters, give with  $NH_2OH$  in hot alc. the oximes of the corresponding isotogenic esters, the added alc. being again split off, are unstable towards alkalis, dissolving even in soda with deep violet color (a very characteristic reaction) which soon pales out, and on addition of acids  $o$ - $H_2O_2$ CCONHC $_6$ H $_4$ CO $_2$ H seps. Et isotogenate (A) can be obtained in 12 g. yield from 100 g.  $o$ -O $_2$ NC $_6$ H $_4$ CHO by Pfeiffer's method (*C. A.* 10, 1334). The Me ester (B) (7 g.) shaken with 12 parts 1% HCl in MeOH until dissolved, filtered, treated with petr. ether and allowed to stand 24 hrs. in a freezing mixt. gives 5.2 g. *N*-hydroxy- $\alpha$ -methoxy- $\alpha$ -carbomethoxy- $\beta$ -ketodihydroindole (C), faintly lemon-yellow crystals from Me $_2$ CO-petr. ether, m. 171° (decompn.), mol.



wt. in boiling Me $_2$ CO 252; acetate, crystals from Et $_2$ O-petr. ether, m. 95-6°, quickly turns yellow in the air; benzoate, felted crystals from Et $_2$ O-petr. ether, m. 141° (decompn.). C (0.9 g.) in AcOH containing a few drops H $_2$ O gives with Zn dust after 0.5 hr. on the H $_2$ O bath 0.27 g. Me indoxylate, m. 155-7°, also obtained in 0.6 g. yield after 10 min. on the H $_2$ O bath from 1.3 g. B. If the C (5 g.) suspended in 12 cc. AcOH is treated with the Zn dust in the presence of MeOH (100 cc.) it yields 3.1 g. of a polymeric methyl indoxylate, sea-green prisms from AcOH, darkens 225°, m. about 245° (decompn.), also obtained from Me indoxylate in MeOH with FeCl $_3$  or from C in MeOH-AcOH with Zn dust; concd. H $_2$ SO $_4$  turns it blackish on gently warming and with hot NaOH it forms indigo. With  $NH_2OH$ .HCl in MeOH under a reflux, 2 g. C gives 1.15 g. of the oxime, m. 221°, of B, hydrolyzed by 4-5 parts of 6% NaOH after 3 days in the dark to isotogenic acid oxime, pale yellow crystals from AcOH, m. 187° (decompn.), which is converted in AcOH-H $_2$ O by Zn dust in the cold into indigo.  $o$ - $H_2O_2$ CCONHC $_6$ H $_4$ CO $_2$ H.H $_2$ O, obtained in 1.1 g. yield from 2.2 g. C in 33 cc. N NaOH acidified with HCl when the intensely violet soln. has become faintly yellow, m. 199-200° (foaming) (Kretschy, *Monatsh.* 5, 30(1884), gives 188-9°). *N*-Hydroxy- $\alpha$ -ethoxy- $\alpha$ -carbethoxy- $\beta$ -ketodihydroindole (D) (1.2 g. from 2 g. A shaken with 16 g. of 2% alc. HCl), yellow prisms from C $_6$ H $_6$ , m. 158-9°. Ethyl isotogenate oxime (E), (0.23 g. from 0.5 g. A in boiling MeOH with aq.  $NH_2OH$ .HCl), m. 187° (decompn.), unstable in the light, sol. in alkalis with dark brown color difficultly sol. in dil. acids, also obtained (0.1 g.) from 0.3 g. D in hot EtOH with  $NH_2OH$ .HCl. *N*-Hydroxy- $\alpha$ -methoxy- $\alpha$ -carbethoxy- $\beta$ -ketodihydroindole (0.9 g. from 2 g. A with 2% HCl in MeOH), pale yellow crystals from C $_6$ H $_6$ , m. 142-3°, gives E in boiling MeOH with  $NH_2OH$ .HCl.  $\alpha$ -Ethoxy- $\alpha$ -carbomethoxy isomer (0.3 g. from 1 g. B in 2% HCl in EtOH), lemon-yellow crystals from C $_6$ H $_6$ , m. 176°; 1.2 g. in boiling MeOH with  $NH_2OH$ .HCl gives 0.45 g. of the oxime of B. C. A. R.

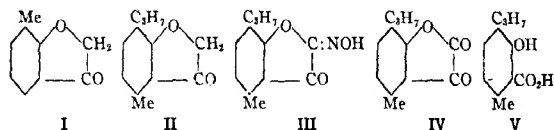
Constitution of the so-called dithiourazole of Martin Freund. I. PRAPHULLA

CHANDRA GUHA. *J. Am. Chem. Soc.* **44**, 1502-10(1922).—G. has shown that the compd. (A) obtained by elimination of 1 mol.  $\text{NH}_3$  from  $(\text{NHCSNH}_2)_2$  by the action of concd.  $\text{HCl}$  and assumed by Freund and Imgart (*Ber.* **28**, 946(1895)) to be dithiourazole has only one atom of H replaceable by K, Na or Ag and loses only one, not two, atoms of H when treated with  $\text{FeCl}_3$ ,  $\text{H}_2\text{O}_2$ , or I, forming a disulfide (B),  $(\text{C}_2\text{H}_3\text{N}_2\text{S}_2)_2\text{S}_2$ ; exptl. evidence in support of this double disulfide formula was furnished by detns. of the amt. of I required for the oxidation and of the mol. wt. of the allyl compd. (found 344) by the b. p. method; F. and I.'s azo or disulfide formula can, therefore, safely be discarded. The di-Ac compd. of A is very unstable and on even mild treatment (boiling with  $\text{H}_2\text{O}$  or heating slightly above the m. p.) it loses one Ac group and forms the stable mono-Ac deriv. G. concludes that A is 5-amino-2-thiol-1,3,4-thiodiazole,  $\text{HSC:N.NH1.C:(NH)S}$  or  $\text{HSC:N.N:C(NH}_2\text{).S}$ . Further evidence in support of this formula is the fact that

the mono-Ac deriv. with I gives the diacetyl disulfide, with alkalis forms mono salts and with alkyl iodides the acetylalkyl derivs.; oxidation of the Ac deriv. and acetylation of B yield the same diacetyl disulfide, and alkylation of the Ac deriv. and acetylation of the monoalkyl derivs. give the same acetylalkyl derivs. The yield of A by F. and I.'s method is increased 30% if the boiling with concd.  $\text{HCl}$  is continued only 10 min. instead of 1 hr. With  $\text{Hg}(\text{NO}_3)_2$  it forms the *nitromercaptide*,  $(\text{C}_2\text{H}_3\text{N}_2\text{S})\text{SHgNO}_3$  (showing that A is a simple monomercaptan), which, when refluxed with  $\text{EtI}$ , yields the compound  $\text{C}_2\text{H}_3\text{N}_2\text{S.EtS.EtHgI.EtI}$ . The amt. of I required for oxidation to the disulfide was also detd. in the case of the 5-phenylamino and 5-allylamino analogs of A. Heated 3 hrs. at  $190-200^\circ$  with  $\text{HCl}$  (d. 1.16), A decomps. into  $\text{N}_2\text{H}_4.2\text{HCl}$ ,  $\text{NH}_4\text{Cl}$ ,  $\text{CS}_2$  and  $\text{CO}_2$ , the formation of the  $\text{CS}_2$  indicating that both S atoms in A are attached to the same C atom. 5-Acetyl-amino-2-methylthiol-1,3,4-thiodiazole, silky needles from dil. alc., m.  $208-9^\circ$ ; 2-ethylthiol homolog, m.  $193^\circ$ . Disulfide  $(\text{C}_2\text{H}_3\text{N}_2\text{S})_2\text{S}_2$  from 4-acetyl-amino-2-thiol-1,3,4-thiodiazole and I in alc. or from B and boiling  $\text{Ac}_2\text{O}$ , white ppt., m.  $275^\circ$ . [Three compds. are listed in a table as 5-phenylamino-2-methylthiol-3,4-thiodiazole,  $\text{C}_{10}\text{H}_{11}\text{N}_2\text{S}_2$ , white silky needles from dil. alc., m.  $139^\circ$ ; acetylmethyl compound,  $\text{C}_{11}\text{H}_{11}\text{ON}_2\text{S}_2$ , m.  $150^\circ$ ; and corresponding acetylethyl derivative,  $\text{C}_{13}\text{H}_{13}\text{ON}_2\text{S}_2$ , from the 2-ethylthiol compd., white silky needles from dil. alc., m.  $76^\circ$ , but no methods of prepn. or structural formulas are given and it is not possible to explain the discrepancy between the names and the empirical formulas given.—ABSTR.] II. New methods of synthesis, isomerism and poly-derivatives. *Ibid* 1510-7.— $\text{H}_2\text{NCSNHNH}_2$  refluxed 10 min. in alc. with 1 mol. each of  $\text{KOH}$  and  $\text{CS}_2$  yields potassium thiosemicarbazidedithiocarboxylate (C),  $\text{H}_2\text{NCSNHNHCS}_2\text{K}$ , which, when heated 3-4 hrs. in alc. at  $130-40^\circ$ , yields the K salt of A; this in  $\text{H}_2\text{O}$  with  $\text{HCl}$  gives the free A, m.  $232^\circ$ . In  $\text{H}_2\text{O}$  with excess of I in  $\text{KI}$ , C gives S and B, m.  $245^\circ$ , which yields A, m.  $244-5^\circ$ , on boiling with  $\text{NaOH}$  and adding  $\text{HCl}$ . After standing about a month, the cryst. C changes into a yellow amorphous powder consisting of B. The above method of synthesis of 5-amino-2-thiolthiodiazoles or 5-imino-2-thiotetrahydrothiodiazoles applies to all substituted and unsubstituted thiosemicarbazides, but except in the case of  $\text{H}_2\text{NCSNHNH}_2$  itself, the intermediate K salt of the dithiocarboxylic acid is rarely formed. The following 2-thio-2,3,4,5-tetrahydro-1,3,4-thiodiazoles were prepd. in this way: 4-phenyl-5-imino, dull yellow needles from  $\text{NaOH} + \text{HCl}$ , m.  $183^\circ$ ; 5-phenylimino (D) (F. and I.'s "phenyldithiourazole"), m.  $208^\circ$ ; 3-phenyl-5-phenylimino, m.  $202^\circ$ ; 3-tolyl-5-tolylimino, m.  $205^\circ$ ; 3-naphthyl-5-naphthylimino, m.  $218^\circ$ ; 3-phenyl-5-tolylimino, m.  $188-9^\circ$ ; 3-tolyl-5-phenylimino, m.  $222^\circ$ ; 3-phenyl-5-naphthylimino, m.  $219^\circ$ ; 3-naphthyl-5-phenylimino, m.  $261^\circ$ ; 3-tolyl-5-naphthylimino, m.  $217^\circ$ ; 3-naphthyl-5-tolylimino, m.  $268^\circ$ ; 3-phenyl-5-allylimino, m.  $145^\circ$ ; 3-tolyl-5-allylimino, dull yellow

needles from alc., m. 125-6°; 4-phenyl-5-methylimino (E), dull yellow crystals, m. 142-3°; 4-tolyl-5-methylimino (F), dull yellow needles, m. 174-5°; 3-naphthyl-5-methylimino, m. 183°; 4-naphthyl-5-methylimino (G), m. 175°. All of these disubstituted derivs. except E, F and G are insol. in alkali and do not form disulfides with I, showing conclusively that there is no mercaptan group (real or potential) in their mol.  $\text{H}_2\text{NCS-NHNH}_2$  (3 g.) heated 4 hrs. at 150° with  $\text{CS}_2$  and  $\text{H}_2\text{O}$  gives 3.2 g. A, the  $\text{H}_2\text{S}$  liberated reacting at the high temp. with some of the A and forming a small amt. of *thiodiazole disulphhydrate*,  $\text{C}_6\text{H}_5\text{N}_2\text{S}_2$ , m. 167°. This method of synthesis of thiodiazole derivs. is not, however, general; apparently, the 1-position in the  $\text{H}_2\text{NCSNHNH}_2$  must be unsubstituted or substituted by positive groups such as Me or Et. A as obtained by F., m. 245° but when allowed to stand 3 months it m. 232° and when heated at 150° with concd. HCl it m. 224°; all 3 forms have the same compn. and show the same behavior, giving the same B with I, the same monoalkyl derivs. with alkyl halides, etc.; the first forms yellowish white prismatic needles, the second transparent white cubes and the third brownish yellow rectangular plates. Similarly, D is described by F. and I. as leaflets m. 219°, but deacetylation of the mono-Ac deriv. gives a tautomeric form in dull yellow needles m. 208°; the mono-Ac deriv. itself, freshly prepd., m. 244° (not 252°; F. and I.), but after several weeks it m. 236°; this low melting form is obtained by heating the di-Ac deriv. slightly above its m. p. C. A. R.

Syntheses in the benzofuran group. I. 7-Methyl-3-coumaranone and 4-methyl-7-isopropyl-3-coumaranone. EFISIO MAMELI. *Gazz. chim. ital.* 52, I, 323-37 (1922).—In previous work (C. A. 8, 2485) M. attempted a dehydration and condensation reaction on *o*- $\text{MeC}_6\text{H}_4\text{OCH}_2\text{CO}_2\text{H}$  (A) and on its Et ester in order to close the pyronic ring and to obtain derivs. of  $\beta$ -benzopyrone (chromanones). It has now been found that when  $\text{PCl}_5$  and  $\text{AlCl}_3$  act on A and on thymohydroxyacetic acid (B) (having the methinic H of iso-Pr) instead of the closure of the hexagonal pyronic ring with the formation of chromanones a pentagonal ketofuranic ring is closed with the formation of the coumaranones I and II.



7-Methyl-3-coumaranone (I), m. 80-90°, gives semicarbazone, oxime and azine as ketonic derivs. and a benzal deriv. of the  $-\text{COCH}_2-$  group. The pentagonal nature of the 2nd ring was established by the action of hot alkali which opens the ring giving *o*-cresotic acid, m. 163-4°. Stoermer and Bartsch (*Ber.* 33, 3179(1900)) described I obtained by another method with a m. p. of 102°. M. repeated their prepn. and obtained I, m. 89°. In the meantime Auwers (C. A. 10, 2725; Auwers and Aulenberg (C. A. 13, 1592) had obtained I by a 3rd method and Higginbottom and Stephen (C. A. 15, 827) obtained I from the chloride of A and  $\text{AlCl}_3$ . 4-Methyl-7-isopropyl-3-coumaranone (II) gave CO and  $-\text{COCH}_2-$  derivs. like those of I. Treated with  $\text{KBrO}$  II gave B. However, by the action of acids the isonitroso derivative (III) was converted into the coumarandione (IV) in which the  $-\text{COCO}-$  group was demonstrated by condensation with *o*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ , giving coumarophenazine, which with  $\text{H}_2\text{O}_2$  gave *o*-thymotic acid (V), thus proving the constitution of II. While in other coumaranones the ring containing  $-\text{COCH}_2-$  is broken by hydrolyzing or oxidizing agents, giving *o*-hydroxybenzoic acids, II is resistant. In the isonitrosocoumaranones in general the  $\text{O.C}(\text{NOH})$  bond is broken, giving *o*-hydroxybenzoylformic acids, while III with HCl or  $\text{H}_2\text{SO}_4$  gives IV instead, corresponding to the behavior of the acyclic isonitrosoketones of hydrindone,

of hydroxythionaphthene and of benzopyrone, which give the corresponding diketones. The few other coumarandiones known could not be obtained in this way but were derived by cyclization of *o*-HOC<sub>6</sub>H<sub>4</sub>COCO<sub>2</sub>H or phenyloxalic acids or derivs. of dihalogen coumaranones and their derivs. IV is sol. in alkalis and alk. carbonate solns. and is reprecipitated with acids, which lactonic behavior corresponds to that of thionaphthenequinone and 4,5-benzocoumaran-2,3-dione (C) and some dialkylcoumarandiones (Fries, Frellstedt, *C. A.* 15, 2873; Stolle, Knebel, *C. A.* 15, 3479). The behavior of IV is thus intermediate between that of coumaran-2,3-dione and C. The substitution of CO in IV for CH<sub>2</sub> in II det. a greater facility and a different manner of ring opening. A was obtained by an improved method (Mameli, *et al.*, *C. A.* 14, 3067) from CH<sub>3</sub>CICO<sub>2</sub>H and *o*-MeC<sub>6</sub>H<sub>4</sub>OH. 6–7 g. A heated with PCl<sub>5</sub> in C<sub>6</sub>H<sub>6</sub> until HCl was no longer evolved was converted into the acid chloride. This mixt. treated with 3–4 mols. AlCl<sub>3</sub> was finally heated 2–3 hrs. The C<sub>6</sub>H<sub>5</sub> was distilled off and the residue distilled with steam. The resulting oil crystallized, giving I as colorless or faintly yellow needles, m. 89–90°. 10 g. A + 50 g. C<sub>6</sub>H<sub>6</sub> + 16 g. P<sub>2</sub>O<sub>5</sub> were heated and gave I when worked up similarly. I exposed to air and light gives a yellow oil that is still under investigation. The semicarbazone of I seps. as long white needles that yellow at 220–5° and m. 238–40°. The azine was obtained with NH<sub>2</sub>OH as a golden yellow crystalline powder that darkens at 205°, m. 223–4° and decomps. 230°. 20.8 g. dry B (cf. *C. A.* 14, 3067, for method of prepn.) in 208 cc. anhydrous C<sub>6</sub>H<sub>6</sub> was cooled and treated with 20.8 g. PCl<sub>5</sub> and heated until HCl was not formed when after 12 hrs. 53.4 g. AlCl<sub>3</sub> were added. The mixt. was decomposed with ice and when worked up as with I gave II as long white needles, m. 60°, having a pleasant odor. II is insol. in NaOH and Na<sub>2</sub>CO<sub>3</sub>. It reduces KMnO<sub>4</sub> in the presence of Na<sub>2</sub>CO<sub>3</sub> but is not oxidized by Br or FeCl<sub>3</sub>. 1.75 g. Br in 28 cc. 25% NaOH at 0° with 2.8 g. II after 2 days gave mainly B, m. 150°. II heated 2 hrs. with NH<sub>4</sub>OH in H<sub>2</sub>O-EtOH gave the oxime of II as a crystalline ppt. m. 155–6°. The semicarbazone of II is a white crystalline mass, m. 191°. II boiled with BzH in abs. EtOH and some KOH sepd. the benzyl derivative as golden red needles, m. 134°. The piperonal derivative was obtained similarly as silky yellow needles, m. 162°. 2-Isonitroso-4-methyl-7-isopropyl-3-coumaranone (III) was obtained by the method of Ponzio and de Gasperi (*Gazz. chim. ital.* 29, I, 472) from II + AmNO<sub>2</sub>, as yellow needles or prisms, m. 164–5°, decomp. 200°. III is slowly sol. in NaOH and alk. carbonates and is reprecipitated unchanged by CO<sub>2</sub> or acids. It does not react with NH<sub>2</sub>OH. III + Ac<sub>2</sub>O + NaOH gives the acetyl derivative as a floccy ppt. m. 127°. 1 g. III + 20 cc. concd. HCl heated under a condenser slowly seps. 4-methyl-7-isopropylcoumaran-2,3-dione (IV) as a red oil that crystallizes, giving yellow needles, m. 105–6°, on cooling. IV was dissolved in 10% NaOH and treated carefully with a few cc. of perhydrol with some cooling. After a day the soln. was acidified, the ppt. filtered off and the ppt. extd. with Na<sub>2</sub>CO<sub>3</sub> in which unchanged IV is only slowly sol. The soln. acidified sepd. V, m. 123°. Equimol. amts. of IV and *o*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub>·2HCl in EtOH were heated 1 hr. and on cooling sepd. 5-methyl-2-isopropylcoumarophenazine as orange-red crystals, m. 217°.

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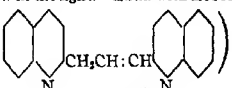
**2,4-Diphenylpyridine.** C. GASTALDI. *Gazz. chim. ital.* 52, I, 305–7 (1922).—In a previous paper G. (*C. A.* 16, 2515) has described the prepn. of the acid sulfate of 2,4-C<sub>6</sub>H<sub>4</sub>NPh<sub>2</sub> (A) from the FeCl<sub>3</sub> salt of 2,4-diphenyl-6-methylpyrrole-HCl (B). By the methods there described 100 g. MeCOPh gave 58–60 g. B and this 18–20 g. 2,4-diphenyl-6-methylpyridine, which gave 10–11 g. 2,4-diphenylpyridine-6-carboxylic acid and this 10–11 g. of the Na salt and finally 6–7 g. of the acid sulfate of A. The latter in H<sub>2</sub>O with excess NH<sub>2</sub>OH seps. A as a colorless liquid. On extg. with Et<sub>2</sub>O and evapg., A seps. as long colorless tables, m. 89°. The hydrochloride of A, C<sub>17</sub>H<sub>13</sub>NCl, seps. from 10% HCl as colorless needles that decomp. on heating. Chloroplatinate,



( $C_{17}H_{14}N_2$ ),  $H_2PtCl_4$ , seps. as an orange-yellow powder or needles, m.  $238^\circ$  (decompn.). *Picrate*,  $C_{17}H_{13}N_2 \cdot C_6H_3(NO_2)_3OH$ , seps. on mixing EtOH solns. as yellow tablets, m.  $187^\circ$  (decompn.). 1 g. A heated in a sealed tube 6-7 hrs. at  $100^\circ$  with 2 g. MeI in 5 cc. MeOH gave the *mehlioidide* of A, long yellow needles from  $H_2O$ , m.  $210^\circ$  (decompn.).

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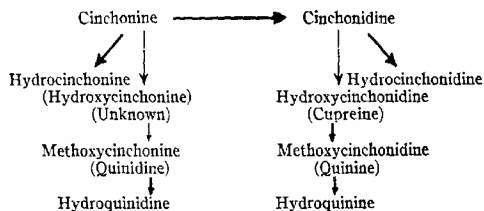
A new red coloring substance from quinoline. M. GULA. *Gazz. chim. ital.* **52**, I, 349-51 (1922).—The cyaninic type of dyes is among the most important that is obtained from quinoline and its homologs. The new dye here described arises by the condensation of quinoline with epichlorohydrin in the presence of NaOH. A dark red oily mass is formed that slowly solidifies. By extg. with EtOH the red compd. here described is obtained. 51.6 g. quinoline + 20 g. epichlorohydrin were heated on the  $H_2O$  bath some hrs. and then treated with 200 cc.  $H_2O$  + 25 cc. 32% KOH and heated several hrs. The semisolid mass seps. and over  $H_2SO_4$  in a desiccator gives a red-brown solid that becomes bright yellow in the light. Extn. with EtOH and  $Et_2O$  gave a product  $C_{24}H_{18}N_2$

(considered to be ) that softens  $193^\circ$  and is melted

at  $220^\circ$ . The *picrate* of I,  $C_{24}H_{18}N_2 \cdot C_6H_3O_7N_3$  is a brick-red powder m.  $194-5^\circ$ . The *chloroplatinate* ( $C_{24}H_{18}N_2 \cdot HCl$ ) $_2PtCl_4$  is a dark yellow ppt.; *chloroaurate*, golden yellow powder; *nitrate*  $C_{24}H_{18}O_7N_3$ , yellow powder obtained by dissolving I in fuming  $HNO_3$  and pptg. with  $H_2O$ .

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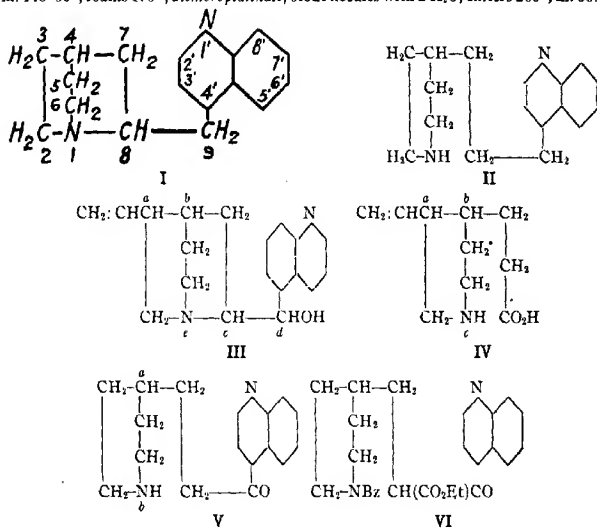
**Cinchona alkaloids. XXIII. Nomenclature and isomerism phenomena.** PAUL RABE. *Ber.* **55B**, 522-32 (1922); cf. *C. A.* **15**, 3110.—R. proposes for 2-quinuclidyl-4'-quinolylmethane (I), the mother substance of the cinchona alkaloids, the name *ruban* (from the *Rubiaceae*, the natural source of the alkaloids; *rubian* would be even better, but Schunck (*Ann.* **66**, 204 (1848)) has already given this name to the bitter principle of the madder), and for the mother substance (II) of the quinatoxines, resulting from the rupture of the 1,8-union in I, the name *rubatoxin*. Thus, quinine would be 6'-methoxy-3-vinyl-9-rubanol, quinene 6'-methoxy-3-vinyl-8-rubene, quininone 6'-methoxy-3-vinyl-9-rubanone, etc. Quinine and its 8 accompanying alkaloids may be grouped as follows, the heavy arrows representing the changes which have been effected experimentally and the pairs of structurally identical but stereoisomeric alkaloids being in the same horizontal line.



Taking the first pair (cinchonine, cinchonidine (III)), they contain 5 asym. centers, viz. the four C atoms at a, b, c and d and N at e. At first sight, then, it would seem that there are  $2^5 = 32$  theoretically possible optically isomeric (enantiostereoisomeric) forms, only 2 of which, as far as is known, occur in the plant. But 2 of the asym. centers (b and e) are the junction points of the quinuclidine ring which belongs to the bicyclic systems with so-called bridge union and therefore, by analogy, cinchonine and cinchonidine should show the same relationships, as regards configuration at the junction points,

as have been found in the careful investigations on canphor and tropine, *i. e.*, the *d*-configuration at the asym. C atom *b* conditions the one, the *l*-configuration the other of the 2 possible configurations at the asym. N atom *c*; these 2 bridge unions diminish the stability of the piperidine ring only slightly, while the 2 others would result in an extraordinarily great strain, as can easily be shown by means of models. As a consequence of this dependence of the configurations on the 2 asym. centers the no. of realizable forms is decreased from 32 to 16. Of the reactions involved in the total synthesis of the cinchona alkaloids, 3 demand a careful consideration of the stereochem. relationships. The synthesis proposed by R. proceeds in 5 stages: 1. Synthesis of cinchonine and of quinic acid. 2. Synthesis of the 2 propionic acids contg. a piperidine residue, *viz.* the so-called homomeroquinene and homocincholoipon. 3. The condensation of the 2 pairs of acids to the quinatoxines. 4. The ring closure in the quinatoxines with formation of the quinaketones, either through the bromo-imines or the bromoketones. 5. The reduction of the ketones to the alkaloids themselves. Homomeroquinene (IV) contains 3 asym. centers (*a*, *b* and *c*) and therefore 8 stereoisomers are theoretically possible; it remains for further investigations (see following abstr.) to show whether isomerism phenomena caused by an asym. N atom (*c*) can be realized. Furthermore, if the theory of an asym. N atom is correct, 9-rubatoxanone (V), with its 2 asym. centers (*a* and *b*) in the *p*-position to each other, should, like Bacyer's hexahydroterephthalic acids, exist in a *cis*- and a *trans*-form, of which only the *cis*-form should be capable of going directly over into a quinuclidine deriv. As a matter of fact, the yield of crude 9-rubanone obtained experimentally was about 50% (a similar yield was obtained with the MeO deriv.), whence it would seem that the V really consisted of a mixt. of the 2 diastereomers, only one of which changed into the quinaketone. Finally, the quinaketones contain, adjacent to the C : O group, a mobile H atom so that in soln. they form a mixt., in dynamic equil., of 2 enantiostereomeric keto and 2 diastereomeric enol forms which on reduction should give 4 enantiostereomeric alcs.; actually, hydrocinchoninone on reduction yields hydrocinchonine, hydrocinchonidine, a stereoisomeric alc. m. 126° and another stereoisomer m. 106°. The above views on isomerism phenomena form a general theoretical introduction to a series of exptl. investigations, the first of which is given in the following abstr. XXIV. The synthesis of vinyl-free quinatoxines and quinaketones. PAUL RABE, KARL KINDLER AND OTTO WAGNER. *Ibid* 532-41.—In the prepn. of  $\beta$ -4-piperidylpropionic acid (A) the method previously described was modified. The crude mixt. of pyridine bases, before fractionation, must be carefully dried over KOH; 360 g. of the fraction b. 140-8° with 320 g. chloral and 3 g. ZnCl<sub>2</sub> gave 60 g. 4-chloralpicoline, m. 166°. Ten g. of the ester of A and 16 g. K<sub>2</sub>CO<sub>3</sub> in 10-5 parts boiling Et<sub>2</sub>O (protected from moisture) treated in the course of 0.5 hr. with 8.6 g. BzCl in an equal vol. of Et<sub>2</sub>O and turbined 3 hrs. gave 92% ethyl  $\beta$ -N-benzoylpiperidyl-4-propionate, thick yellow bitter odorless oil, b<sub>s</sub> 240°; heated 3.5 hrs. at 80-5° with 1 mol. of Et cinchoninate and a 10% excess of NaOEt suspended in C<sub>6</sub>H<sub>6</sub>, it gives 66% of the  $\beta$ -ketonic ester (VI) as a thick brown oil permeated with crystals; 2 g. of this boiled 4 hrs. under a reflux with 20 g. of 17% HCl yields 0.7 g. 9-rubatoxanone ( $\beta$ -piperidyl-4-ethyl 4'-quinolyl ketone), thick yellow bitter oil giving the reactions of the quinatoxines (strongly alk., gives a cherry-red color with diazobenzenesulfonic acid and a red-violet color with PbNO<sub>2</sub> contg. nitrothiophene); dichloroplatinate, dark yellow crystals with 2 H<sub>2</sub>O, blackens 245°, m. 240-5°; 0.5 g. in 1 g. 48% HBr at 100° slowly treated with 1 g. Br in 11 g. concd. HBr and evapd. in *vacuo* over KOH yields yellow crystals, m. 184°, deliquescent in the air, probably consisting of 8-bromo-9-rubatoxanone dihydrobromide; these treated under Et<sub>2</sub>O with small portions of Na<sub>2</sub>CO<sub>3</sub>, the mixt. being thoroughly shaken after each addn. of the soda, dried with KOH and evapd. give 0.4 g. of a thick brown oil still contg. a little Br, which, heated a short time on the H<sub>2</sub>O bath in a little

concd. HCl with 0.5 g.  $\text{SnCl}_2$ , gives 0.3 g. *g-rubanone* (8-quinuclidyl 4'-quinolyl ketone), thick yellow bitter oil no longer giving the quinatoxine reactions; *monopicrate*, yellow needles from alc., sinters  $170-80^\circ$ . The  $\beta$ -ketonic ester obtained in 50% yield by the condensation of the ester of A with Et quinate is a thick yellow oil giving 50% of *6-methoxy-g-rubatoxanone* ( $\beta$ -piperidyl-4-ethyl 6'-methoxy-4'-quinolyl ketone), thick reddish yellow oil giving the same reactions as the quinatoxine obtained from quinine (sol. in acids with yellow color, blues litmus in even very dil. alc. soln., sol. in the usual org. solvents, difficultly in cold, easily in hot  $\text{H}_2\text{O}$ , very bitter, gives in very dil. alc. soln. with Cl water and excess of  $\text{NH}_4\text{OH}$  an emerald-green color, with  $\text{PhNO}_2$  contg. nitrothiophene a red-violet color, with diazobenzenesulfonic acid a red color); *dichloroplatinate* ( $2 \text{ H}_2\text{O}$ ), sinters  $265^\circ$ , m.  $278-85^\circ$ ; *monopicrate*, oily; *monopicrotolonate*, m.  $152^\circ$ . 6'-Methoxy-8-bromo-*g-rubatoxanone*, could not be obtained in solid form. 6'-Methoxy-*g-rubanone* (8-quinuclidyl 6'-methoxy-4'-quinolyl ketone) (0.55 g. from 1.3 g. of the quinatoxine through the Br deriv.), thick yellow oil gradually depositing a small amt. of crystals, tastes bitter, becomes discolored in the light, even in a vacuum desiccator, does not give the quinatoxine reactions but resembles quininone by dissolving in mineral acids with intense yellow color and in that the yellow color of its alc. solns. deepens on addition of NaOH and especially of NaOEt; *monopicrate*, sinters  $168^\circ$ , m.  $173-4^\circ$ ; *monopicrotolonate*, m.  $148-50^\circ$ , foams  $170^\circ$ ; *dichloroplatinate*, stout needles with  $2 \text{ H}_2\text{O}$ , sinters  $260^\circ$ , m.  $300^\circ$ .



C. A. R.

**Strychnos alkaloids. XXX. The transformations of cacotheline.** HERMANN LEUCHS, FRITZ OSTERBURG AND HANS KAEHRN. *Ber.* 55B, 564-72 (1922); cf. C. A. 16, 1096.—That cacotheline (A) has the groupings shown in the formula  $\text{C}_{16}\text{H}_{17}[\text{CO} \dots \text{CO} \dots \text{CNO}_2, \text{NH}(\text{NO}_2), \text{NH}, \text{CO}_2\text{H}, \text{CH}(\text{OH})]$  has been verified experimentally. A is obtained in 43.5-5.0 g. yield from 39.4 g. dry brucine in 200 cc. of 5 N  $\text{HNO}_3$  heated 15 min. at  $50-60^\circ$  and allowed to stand some hrs. in ice; 1 g. of the free base of A in 20 cc. MeOH treated with HCl gas and heated on the  $\text{H}_2\text{O}$  bath gives 0.8 g. of the

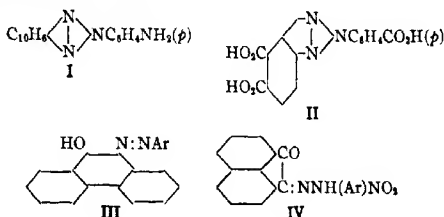
*methyl ester hydrochloride*,  $C_{21}H_{19}O_7N_4Cl \cdot H_2O$ , fine red-brown needles, giving with  $NaHCO_3$  an amorphous ppt. sol. in more  $H_2O$ . *Ethyl ester hydrochloride*, needles from  $EtOH \cdot HCl$ . From 3 g. of A with Sn and concd.  $HCl$  is obtained 1.2 g. of the *aminoquinol dihydrochloride*,  $C_{21}H_{19}O_4N_4 \cdot 2HCl$ , 3-, 4- and 5-sided tables from 4 parts  $H_2O$  + 2 parts of 12 N  $HCl$ ; its solns. are turned yellow, then brown, by  $NH_4OH$ , yellow, brown, brown-violet and finally red-yellow by alkali, the last color changing on warming through violet, colorless, faint or deep blue to a permanent yellow. *Semicarbazone nitrate*,  $C_{21}H_{19}O_7N_4 \cdot HNO_3 \cdot 3H_2O$  (5.33 g. from 5.08 g. A in 120 cc.  $H_2O$  boiled 10 min. with 1.67 g.  $H_2NCO \cdot NHNH_2 \cdot HCl$  in 10 cc.  $H_2O$  and then treated with 25 cc. of 5 N  $HNO_3$ ), needles from  $H_2O$ ; free base, light yellow needles and short stout prisms with 4  $H_2O$ , sol. in  $NH_4OH$ , alkalies and  $NaHCO_3$  with red-yellow color. *Phenyldiazotization hydrochloride*,  $C_{21}H_{19}O_7N_4Cl \cdot 3H_2O$  (0.9 g. from 1 g. of the oxime-HCl (see below) in boiling  $H_2O$  with  $PhNHNH_2 \cdot HCl$  and  $HCl$ ), light brown 4- or 6-sided tablets, sol. in dil. alkalies or  $NH_4OH$  with wine-red, in  $NaHCO_3$  with yellow, in  $H_2SO_4$  with light red color; free base, brown-yellow prisms with 4  $H_2O$ , sol. in about 7,000–8,000 parts  $H_2O$  at  $100^\circ$ . *Oxime hydrochloride*,  $C_{21}H_{19}O_7N_4Cl \cdot 3H_2O$  (5–5.08 g. from 5.08 g. A and  $NH_4OH \cdot HCl$  in  $H_2O$  at  $100^\circ$ ), fine yellow needles, hydrolyzes in  $H_2O$ , sol. in 400–440 parts of 0.5 N  $HCl$ , dissolves in  $NH_4OH$  and dil. alkalies with yellow color, yields yellow needles of a salt with concd.  $KOH$ , gives with  $SnCl_2$  a red, with  $Zn \cdot HCl$  a greenish color and no violet color with  $SO_2$ ; free oxime, yellow needles with 4  $H_2O$ ; sulfate, long slender yellow needles with 4 and 6  $H_2O$ ; acetate, yellow needles with 4  $H_2O$ ; nitrate, prisms with 4  $H_2O$ ; hydrobromide, seps. with 3  $H_2O$ . Boiling 2.5 N  $HNO_3$  converts the oxime or its  $HCl$  salt into A, while 3 g. of the oxime-HCl in 30 cc. 12 N  $HCl$  with 3 g. Zn powder, first at  $0^\circ$ , then 0.5 hr. at room temp. and finally, after diln. with 30 cc.  $H_2O$ , at  $40$ – $60^\circ$  gives the *diaminophenol*, isolated as the *trihydrobromide*,  $C_{21}H_{23}O_3N_4Br_3$ , colorless to faintly brownish needles or pointed 3-sided leaflets from aq.  $HBr \cdot MeOH$ , turned brown by  $NH_4OH$  and by  $NaOH$ , the latter liberating  $NH_3$  on warming and giving a red-violet color. *Methyl ester oxime hydrochloride* (0.8 g. from 1 g. of the oxime-HCl in  $MeOH$  with dry  $HCl$ ), seps. with 4  $H_2O$ ; free ester oxime, yellow-green amorphous ppt. soon changing into light brown needles. The *ethyl ester oxime* and its *hydrochloride* are gelatinous. The *Me ester oxime-HCl* heated 2 hrs. at  $100^\circ$  with  $MeOH$  75% satd. with  $NH_3$  yields 0.5 g. of the *methyl ester nitrosoamine*,  $C_{21}H_{19}O_4N_3$ , nitroso-green prisms, difficultly sol. in  $H_2O$  and  $NH_4OH$ , easily in acids, rapidly in alkalies, evolving  $NH_3$  on heating. *Dimethyl sulfate compound of A*,  $C_{21}H_{17}O_{11}N_4S$ , from the free base of A in  $MeOH$  boiled 2 hrs. with  $Me_2SO_4$ , yellow-brown 6-sided tablets. C. A. R.

**Aminoazo, hydroxyazo and hydrazo compounds.** G. CHARRIER (with six pupils). *Gazz. chim. ital.* 52, I, 261–77 (1922).—By previous work C. has shown that *o*-aminoazo compds. of the  $C_{12}H_8$  and  $C_{10}H_6$  series are transformed by heat into benzo- and naphtho-*N*-aryltriazoles, *o*-diamines and primary amines thus:  $3 H_2NAr \cdot N : NAr' \longrightarrow 2 Ar' : N_2Ar' + Ar'(NH_2)_2 + Ar'NH_2$ . The reaction has now been extended to *o*-aminoazobenzene (A) (Witt, C. A. 7, 83) which decomps. with heat as stated above. This reaction confirms the constitution of A as established by W. by reduction. The *o*-aminoazo compd. *p*-nitrophenylazo- $\beta$ -naphthylamine (B) was heated to obtain *N*-*p*-nitrophenyl-1,2-naphthotriazole (C) which on reduction gives *N*-*p*-aminophenyl-1,2-naphthotriazole (I), the 1st of a new series. I was synthesized in 2 ways. In 1 case *p*-nitrobenzeneazo- $\beta$ -naphthylamine was oxidized with  $CrO_3$  in  $AcOH$  and the C obtained decompd. with heat, giving I. 1-*p*-Acetylphenylazo-2-aminonaphthalene (D) (*p*-acetylphenylazo- $\beta$ -naphthylamine) behaves anomalously on heating and gives a ketotriazole which condenses with the 1,2- $C_{10}H_6(NH_2)_2$  formed according to the above reaction, giving a compd., m.  $288^\circ$ , which is being studied. D, however, with  $AcOH + CrO_3$  gives *N*-*p*-acetylphenyl-1,2-naphthotriazole (E) (1,2-naphthotriazole-*N*-phenyl-

*p*-methyl ketone). Oxidation of **E** with alk.  $\text{KMnO}_4$  gave *vic-N-p-carboxyphenyltriazole-phthalic acid* (**II**), which on fusion loses  $\text{H}_2\text{O} + \text{CO}_2$ , giving *vic-N-phenyltriazole-phthalic anhydride* (**F**). *p*-Aminophenylazo- $\beta$ -naphthol (*1-p-aminophenylazo-2-hydroxy-naphthalene*) (**G**) is a deriv. of phenylazo- $\beta$  naphthol and is obtained from *p*- $\text{AcNHC}_6\text{H}_4\text{N}_2\text{Cl}$  and alk.  $\beta$ -naphthol and sapon. of the Ac deriv. in concd.  $\text{HCl}$  in  $\text{EtOH}$ , giving the  $\text{HCl}$  salt, which with alkali gives **G**. Five new hydroxyazophenanthrols were obtained as follows: *o-o*-, *m*-, and *p-nitrophenylazo-10-phenanthrols* (**H**, **J** and **K**), *o-p-bromophenylazo-10-phenanthrol* (**L**) and *o-p-acetylphenylazo-10-phenanthrol* (**M**). It is known that the 9-arylazo derivs. of 10-phenanthrol are obtained in 2 ways (Werner, *Ann.* 321, 303(1902); Auwers, *C. A.* 5, 877; Charrier and Ferreri, *C. A.* 9, 792). These were obtained by **C**. by the action of the  $\text{HCl}$  salts of the arylhydrazones on phenanthrenequinone as well crystd. stable compds., little sol. in org. solvents, having the general formula **III**. The *p*-acetylphenylhydrazine (**N**) required for **M** was obtained from *p*- $\text{AcC}_6\text{H}_4\text{N}_2\text{Cl}$  (from *p*- $\text{AcC}_6\text{H}_4\text{NH}_2 + \text{HNO}_3$ ) by the  $\text{SnCl}_2$  method. **N** undergoes intramol. condensation between the  $\text{NH}_2$  and  $\text{CO}$  groups with the loss of  $\text{H}_2\text{O}$ . Equimol. amts. of arylhydrazine hydrochlorides acting on acenaphthenequinone in  $\text{AcOH}$  gave the following arylhydrazones of acenaphthenequinone (**IV**): *o-nitrophenylhydrazone*, shining orange-red needles, *m.* 249°; *m*-derivative, golden yellow needles, *m.* 229-30°; *p*-derivative, orange-red needles, *m.* 247°; *p*-acetylphenylhydrazone, red-brown prisms, *m.* 244-5°. The analogous reaction with phenanthrenequinone gives hydroxyazo compds. (Charrier, Ferreri, *C. A.* 9, 792; Cruto, *C. A.* 10, 1857). 10 g. **A** were heated in an alloy bath at 300-20°. A red liquid distd. at about 190°, identified as  $\text{PhNH}_2$  by diazotizing and copulating with  $\beta$ -naphthol. The residue was phenylene-*N*-phenyltriazole, colorless needles from  $\text{EtOH}$ , *m.* 109°. *N*-Phenylbenzotriazole and *o*- $\text{C}_6\text{H}_4(\text{NH})_2$ , as well as  $\text{C}_6\text{H}_4\text{NH.N.N}$ , *m.* 100°,

were sepd. from the mother liquor. **A** in concd.  $\text{H}_2\text{SO}_4$  at 0° was treated with  $\text{NaNO}_2$  and after standing some time, diln. and distn. with steam gave red crystals of *o*-hydroxyazobenzene, *m.* 83°, in the distillate. **B** was obtained by Meldola's method (*J. Chem. Soc.* 59, 379(1891)) as bronzy needles, *m.* 185°, and on heating gave **C**, *m.* 235-6°. **C** reduced in  $\text{AcOH}$  with  $\text{Zn}$  dust gave **I** quant., when the soln. was filtered, dild. and neutralized with  $\text{NaOH}$ , as straw-colored crystals from ligroin, *m.* 198-9°. **I** was obtained in better yield from *p*-acetylaminophenylazo- $\beta$ -naphthylamine (**O**), which was obtained from *p*- $\text{AcNHC}_6\text{H}_4\text{N}_2\text{Cl}$  acting on  $\beta$ - $\text{C}_{10}\text{H}_7\text{NH}_2$  as red needles, *m.* 203°. **O** oxidized in  $\text{AcOH}$  with  $\text{CrO}_3$  gave *N*-*p*-acetylaminophenyl-1,2-naphthotriazole, white needles, *m.* 226°, which was deacetylated by boiling in  $\text{HCl} + \text{EtOH}$ , cooling and sepg. **I** by neutralizing with  $\text{NaOH}$ . **D** in  $\text{AcOH}$  with  $\text{CrO}_3$  seps. **E**, straw-white needles, *m.* 185°. The *p*-bromophenylhydrazone of **E** seps. as phototropic yellow leaves, *m.* 215°; phenylhydrazone, bright yellow crystals, *m.* 181°; oxime, yellowish white microcrystals, *m.* 253°; *o*-nitrophenylhydrazone, red-yellow leaves, *m.* 180°. 1 part **E** + 5 parts  $\text{KMnO}_4$  in 1%  $\text{NaOH}$  were boiled 12-14 hrs. The excess  $\text{KMnO}_4$  was decompd. with  $\text{EtOH}$ , the soln. was filtered and **II** sepd. by the addition of  $\text{HCl}$ ; **II** seps. as minute white crystals from  $\text{H}_2\text{O}$ , *m.* 291-2° (decompn.), giving **F**, *m.* 225-30°. **D** was obtained from *p*- $\text{AcC}_6\text{H}_4\text{N}_2\text{Cl}$  acting on  $\beta$ - $\text{C}_{10}\text{H}_7\text{NH}_2$  in  $\text{EtOH}$  as red needles with a metallic reflex, *m.* 170°. The *p*-bromophenylhydrazone of **D** seps. as red leaves, *m.* 217°; phenylhydrazone, garnet-red crystals, *m.* 187°; oxime, garnet-red prisms, *m.* 206°. The acetyl derivative of **G** was obtained as stated as bright red needles, *m.* 259-60°, and was sapond. in  $\text{EtOH-HCl}$ , giving **G** as brown-red needles, *m.* 159-60°, of which the hydrochloride,  $\text{C}_{10}\text{H}_7\text{N}_2\text{O.HCl}$ , is a red powder.  $\text{Me}_2\text{SO}_4$  in 30%  $\text{NaOH}$  with **G** gave the methyl ether of **G**, which was not crystd. but gives cryst.  $\text{HCl}$  and  $\text{HNO}_3$  derivs. The ethyl ether of **G** was also a dense oil; the nitrate  $\text{C}_{11}\text{H}_7\text{N}_2\text{O}_3\text{HNO}_3$  forms green needles, *m.* 95-6° (decompn.). **G** in concd.  $\text{H}_2\text{SO}_4$  at 0° treated with  $\text{NaNO}_2$  gave finally *p*-hydroxyphenylazo- $\beta$ -naphthol as green needles, *m.*

194°. **L** sepd. from AcOH as small red needles, m. 188°; **M** seps. as brick-red needles, m. 219°; **H** gives red needles, m. 185°; **J** gives orange-red needles, m. 196–7° (decompn.); **K** gives bright red needles, m. 185°.



E. J. WITZMANN

Nature of the diazonium group (SCHOUTISSEN) 25. Crystal forms of the substituted aliphatic ammonium bromo-selenates and -tellurates and their relations to the corresponding platينات (MAIER) 2. Conditions governing the formation and stability of ammonium carbamate (MATIGNON, FRÉJACQUES) 2. The transformation of ammonium carbamate (MATIGNON, FRÉJACQUES) 2.

**Butyraldehyde.** D. A. LEGG. U. S. 1,418,448, June 6. Butyraldehyde is formed by dehydrogenation of normal primary butyl alc. by means of fused CuO as a catalyst.

**Succinic acid.** UMETARÔ SUZUKI and YOSHIHIKO MATSUYAMA. Jap. 39,310, July 11, 1921. Succinic acid is prepd. by oxidizing glutamic acid or proteins contg. large quantity of the acid with HNO<sub>3</sub> with V as catalyzer. *E. g.*, a mixt. of 10 g. glutamic acid, 50 cc. concd. HNO<sub>3</sub> and 0.005 g. vanadium oxide is gradually heated and the soln. is concd. by evapn. The yield is 5–6 g. Also from a mixt. of 10 g. gluten, 70 cc. concd. HNO<sub>3</sub> and 0.003 g. V, 1.2 g. of the acid is obtained; in this case the acid must be sepd. from other oxidation products.

**Oxidizing olefins.** C. ELLIS. U. S. 1,418,368, June 6. An acid ext. of olefins from cracked petroleum is treated with dil. HNO<sub>3</sub> to effect oxidation and produce ketones and fatty acids which may be used as solvents of celluloid or other materials.

**Dichloroethylene.** F. KAUFER. U. S. 1,419,969, June 20. Vapors of C<sub>2</sub>H<sub>2</sub>Cl<sub>4</sub> and steam at ordinary atm. pressure are brought into contact with a metal such as Fe or Zn capable of effecting dechlorination and production of dichloroethylene.

**Chlorinating acetylene.** K. ROKA. U. S. 1,418,882, June 6. Cl and C<sub>2</sub>H<sub>2</sub> are heated with steam, to form mixed chlorination products.

**Urea from cyanamide.** E. LIE. U. S. 1,419,157, June 13. See Can. 218,050 (C. A. 16, 1960).

**Semicarbazide hydrochloride.** HIDEO OCHI. Jap. 39,219, July 11, 1921. Semicarbazide-HCl is prepd. from nitrourea by electrolytic reduction. A mixt. of nitrourea with 10 parts of 10% HCl is put into a lead cylinder (cathode), in which is a porous cell contg. 25% H<sub>2</sub>SO<sub>4</sub>. As an anode a spiral of lead tube is used. The operation is conducted at 0–5°, with a current of 1 amp. per 1 sq. dm. and 4 v. When the reaction is complete the cathode soln. is evapd. *in vacuo*.

***m*-Hydroxybenzaldehyde.** J. B. SLIMM. U. S. 1,419,695, June 13. *m*-Hydroxybenzaldehyde is prepd. by diazotizing *m*-aminobenzaldehyde-bisulfite addition compd. and simultaneously removing N and SO<sub>2</sub> by heating the resulting diazonium soln.

**Aniline salt of phenylglycine.** L. E. H. CONE. U. S. 1,419,720, June 13. The Na salt of chloroacetic acid is dissolved in a cold aq. soln. of aniline and the soln. thus

formed is added to a hot aq. soln. of aniline to form the aniline salt of phenylglycine. This is crystd. and washed with a cold. aq. aniline soln.

**Tropinonecarboxylic acid esters.** O. WOLFES and H. MAEDER. U. S. 1,419,092, June 6. An aq. soln. of succinic dialdehyde is added to a soln. of acetoacetic esters, alkali and methylamine and the reaction products are shaken with  $\text{CHCl}_3$  and the  $\text{CHCl}_3$  soln. thus obtained is extd. with dil.  $\text{H}_2\text{SO}_4$  to obtain (on adding soda and extg. with  $\text{CHCl}_3$ ) a tropinonecarboxylic acid ethyl ester, an oily substance which solidifies on exposure to the air for some time.

**Tropinonecarboxylic acid esters.** R. WILLSTÄTTER, O. WOLFES and H. MAEDER. U. S. 1,419,091, June 6. Succinic dialdehyde is condensed with mono-Ca salt of acetone-dicarboxylic acid ethyl ester and methylamine. The tropinone ester formed is an oily substance which hardens when exposed to air and takes up 2 mols. of  $\text{H}_2\text{O}$  and m.  $62-63^\circ$ . It is easily sol. in alc., ether and  $\text{CHCl}_3$  but does not crystallize from these solvents. Its picrate m.  $133-135^\circ$ .

**Purifying anthracene.** L. WEIL. U. S. 1,419,186, June 13. Crude anthracene is distd. with petroleum hydrocarbons having a b. p. of about  $300^\circ$  and the anthracene is crystd. and sepd. from the distillate.

**Anthraquinone derivatives.** K. WILKE. U. S. 1,417,875, May 30. By the action of fuming  $\text{H}_2\text{SO}_4$  upon 1-nitro-2-alkylantraquinones products are formed which are insol. in alkalis and are good starting materials for manuf. of dyes. Conducting the reaction with exclusion of air gives products of greater purity. Elimination of  $\text{H}_2\text{O}$  occurs between the nitro and alkyl group with formation of new isoxazole derivs. of anthraquinone. 1-Nitro-2-methylantraquinone yields a product m. about  $250^\circ$ , sol. in xylene and having the formula  $\text{C}_{15}\text{H}_7\text{NO}_3$  (1,2-anthraquinoneisoxazole), decomposing on melting. 1,5-Dinitro-2-methylantraquinone yields greenish yellow crystals of 5-nitro-1,2-anthraquinoneisoxazole. 1-Nitro-2-ethylantraquinone yields 1,2-anthraquinonemethylisoxazole, coarse dark brown crystals, m. about  $210^\circ$ . 1-Nitro-2-methyl-5,6,7,8-tetrachloroanthraquinone yields 5,6,7,8-tetrachloro-1,2-anthraquinoneisoxazole, a greenish yellow powder m. about  $242^\circ$  (decompn.).

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

**Henri Van Laer.** A. J. J. VANDEVELDE. *Bull. soc. chim. Belg.* 30, 7-8(1921).—An obituary. WM. STERICKER

**Note on the characters of scorpion venom with demonstration of a method of obtaining the same.** WM. H. WILSON. *Bull. inst. Egypte* 3, 67-73(1921).—By a method described the venom of *Prionurus citrinus* and *Buthus quinque-striatus* was obtained in vols. varying with the size of the specimen from 4 to 20 cu. mm. The former is a milky white fluid of limpid consistence, distinctly acid in reaction; the latter is transparent and opalescent. Microscopically, *P. citrinus* venom consists of a clear plasma with very numerous refractile globules of two types, large, from 7 to  $10\ \mu$ , and small, of approx.  $2-3\ \mu$ , in diam. It has a sp. gr. of 1.903, and contains 6.5% mineral salts and 13.7% other solid material, chiefly protein. The granules constitute about 20% of the total vol., are insol. in  $\text{H}_2\text{O}$ , dil.  $\text{HNO}_3$  and 1%  $\text{NaOH}$ . Various staining reactions are described. The plasma is partially pptd. by  $\text{EtOH}$ , gives a mucinoid coagulum with water and 10%  $\text{NaOH}$ , a dense white ppt. with  $\text{HNO}_3$  and satd.  $(\text{NH}_4)_2\text{SO}_4$ ; it is coagulated but slightly, if at all, by heat. It is possible that the pro-

tein, probably the active principle, may be a histone. The saline ext. of the stings themselves is insol. in  $H_2O$  and is pptd. by 90% EtOH and  $(NH_4)_2SO_4$ . It shows protein reactions and does not dialyze; its activity is not destroyed by  $NH_4OH$  or boiling unless for more than 10 min., but is destroyed by EtOH. In contrast with the venom of spiders and snakes the activity of that of *P. citrinus* is not destroyed by putrefaction.

P. R. DAWSON

**Combined action of enzymes.** A. J. J. VANDEVELDE. *Natuurwetenschapp. Tijdschr.* 3, 200-3(1921).—The assumption that enzymic action in a living organism is due to the combined action of several enzymes is tested by expt. The action of a mixt. of invertase (extd. from yeast) and of amylase (extd. from malt) is compared with the action of each enzyme alone. No increased action could be observed although the expt. was repeated in various ways. There is no evidence of a difference in the action of enzymes alone and in mixts.

R. BEUTNER

**The measurement of buffer values and the relationship of buffer value to the dissociation constant of the buffer and the concentration and reaction of the buffer solution.** DONALD D. VAN SLYKE. *J. Biol. Chem.* 52, 525-70(1922).—As a numerical measure of the buffer value ( $\beta$ ) of a soln. it is proposed to use the number of g. equivs. of strong alkali or acid taken up by a liter of soln. per unit change in  $p_H$ . Since ( $\beta$ ) varies with varying  $p_H$ , the value at any given  $p_H$  is defined by the ratio  $dB/dp_H$ . A general equation for the value of  $\beta$  has been derived from the general mass action equations.  $\beta = dB/dp_H$

$$dp_H = 2.3 \left( \frac{K'[H^+]C}{(K' + [H^+])^2} + [H^+] + [OH^-] \right). \quad K' = \frac{K_a}{\gamma_a} \text{ for weak acids, where } K_a$$

is the acid dissociation const.,  $\gamma_a$  the fraction of the salt  $Ba$  dissociated into  $[B^+]$

and  $[a^-]$  ions. For weak bases,  $K' = \frac{K_b\gamma_b}{K_s}$ .  $C$  indicates the concn. of the

buffer. When  $C = 0$ , and no weak acid or base is present, the buffer equation simplifies to  $\beta = 2.3 ([H^+] + [OH^-])$ , which indicates the buffer value of  $H_2O +$  strong acid or alkali. When  $p_H$  is between 3 and 11, and  $C$  has a value not much less than 0.1 N,  $[H^+]$  and  $[OH^-]$  are relatively so small that the equation simplifies to  $\beta = 2.3 (K'[H^+]C)/(K' + [H^+])^2$ . Under these conditions, the mol. buffer value  $\beta_m = (\beta/C) = 2.3 K'[H^+]/(K' + [H^+])^2$ .  $\beta$  has its max. value for every buffer when  $[H^+] = K'$ . At this point  $\beta_m = 0.575$  for every buffer and  $1/2$  the buffer is in the form of free acid or base and  $1/2$  in the form of its salt. The basic equation can be used for calcn. of the acid and basic dissociation consts. and mol. wts. of buffers and the calcn. of the buffer values of mixed, multivalent and amphoteric buffers. Examples of such use are given.  $\beta$  may be detd. experimentally by plotting the amt. of acid or alkali added against the change in  $p_H$  produced, drawing a tangent at the desired  $p_H$  and detg. the slope of this tangent. The ratio of acid or alkali added to the change in  $p_H$  produced gives the av. value over that range. If this range is not too great, the av. represents the actual buffer value at any point within those limits. The buffer value of normal human blood is shown to approximate that of a 0.04 N soln. of a buffer acid with  $K' = 10^{-7.4}$ .

I. GREENWALD

**Studies of autolysis. VIII. The nature of autolytic enzymes.** H. C. BRADLEY. *J. Biol. Chem.* 52, 467-84(1922).—Pig pancreas and beef kidney are readily and rapidly digested by trypsin at a reaction that is so alk. that autolysis (same prepn. without trypsin) is almost completely inhibited. Similarly, the addition of pepsin to an autolyzing prepn. of beef kidney or of pig liver increases the rate of digestion *least* at the optimum reaction for autolysis. The optimum reaction for peptic digestion of beef kidney or liver, or pig liver, is  $p_H 1.5 \pm$ , which is sufficiently acid almost to completely



inhibit autolysis. There appear to be 2 proteases concerned in autolysis. One digests the acid salts of protein (formed as the reaction of the tissue becomes acid after death) and is active between  $p_H$  7 and 3; the other, which is present in abundance, is active between  $p_H$  8 and 3—, does not attack the acid salts of the proteins but acts only on the products formed by the action of the first enzyme. I. GREENWALD

**Electric cataphoresis of metallic protein compounds obtained by treatment with powdered metals.** A. BENEDICENTI AND S. REBELLO-ALVES. *Arch. intern. pharmacodynamie* 26, 297-316(1922).—In shaking a soln. of egg albumin or of blood serum with powdered metals the metals become attached to the proteins and the properties of the latter change. They become colored, their reactions are altered, they are not coagulated by heat and resist putrefaction. The "fixation" of the metals is independent of the reaction of the protein soln. and of its gas and salt content. The metals in this combination lose their ionic properties and are not dialyzable. Metals vary in their power to combine with proteins: Co, Cu and Fe combine to a greater extent than do Al and Pb. Powdered oxides of the metals do not combine with proteins. By passage of an elec. current through an alk. soln. of the metallic protein compd. the protein particles become negatively charged and move towards the positive electrode, carrying with them the fixed metal. In an acid soln. the protein particles become negatively charged, move to the cathode and a part of the metal is deposited upon the electrode. At the chem. neutral (isoelec. ?) point a protein coagulum forms, which gradually changes into a membrane upon which the fixed metal deposits. Boiling or heating a metallic protein soln. to 50-60° changes profoundly its electrophoretic properties. It is proposed that the thermolability of sera, the fixation of metals by certain organs and their elimination, etc., depend upon the formation of metastable protein compds. and upon changes in the chem. equilibria of these compds. W. A. PERLZWEIG

**The action of arginase upon agmatine and tetramethylenediguanidine** The specificity of enzyme action. A. KIESEL. *Z. physiol. Chem.* 118, 284-300(1922).—Arginase (present in *Aspergillus niger*, *Secale cornutum*, *Agaricus campestris*, and *Vicia sativa*) exerted no action upon agmatine. When tetramethylenediguanidine was substituted for agmatine, agmatine was formed. This occurred only when *Aspergillus* was the source of arginase but not when the other plants mentioned or *Lupinus albus* or *Trifolium pratense* were employed. R. L. STEHLE

**Yeast protein.** A. KIESEL. *Z. physiol. Chem.* 118, 304-6(1922).—Yeast albumin gave humin N 15.22%, ammonia N 4.5%, histidine N 5.22%, arginine N 7.96%, and lysine N 7.96%. R. L. STEHLE

**Invertase from *Mucor racemosus*.** S. KOSTYCHEV AND P. ELIASBERG. *Z. physiol. Chem.* 118, 233-5(1922).—*Mucor racemosus* —, but not *M. racemosus* +, contains invertase. R. L. STEHLE

**Surface tension of serum. III. Recovery after lowering by surface-active substances.** P. LÉCOMTE DU NOUY. *J. Exptl. Med.* 36, 115-34(1922); cf. C. A. 16, 1981.—The equil. of the serum corresponding to its normal minimal surface tension is as stable and difficult to break as the osmotic tension equil. The addition of a strong surface-active substance (Na oleate, glycocholate or taurocholate) will not lower it definitely unless the substance is present in large amts. and in soln. After the 1st rapid drop has occurred, a process of recovery takes place which brings back the normal surface tension in a short time. This process of recovery is a normal one of defense in all cases in which surface-active substances (bile) are set free in the blood. Dild., the serum shows the same phenomenon to a smaller extent. The recovery is stronger when the surface-active substance is added powdered or in highly concd. soln., and not stirred. The recovery does not seem to be inversely proportional to the concn. of Na oleate, when added superficially. The recovery is due to adsorption and follows a logarithmic

law in all cases. Temp. at first enhances the phenomenon but finally decreases it.

C. J. W.

General theory of adsorption from solution (OSTWALD, IZAGUIRRE) 2.

## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

A simple colorimeter for clinical use. J. de Haan. *Nederland. Tijdschr. Geneeskunde* 66, 1076(1922).—The app. consists of two rows of test-tubes held in a frame, the under part of which is formed by a glass plate. This frame slides over a Cu frame with a window so as to allow the colorimetric comparison of two test-tubes. R. B.

The determination of total albumin in the spinal fluid. J. B. AYER AND H. E. FOSTER. *Repert. pharm.* 34, 114-5(1922).—The albumin is pptd. with thioisalicic acid and compared with the ppt. obtained from blood serum of known albumin content. The method is very exact. The normal quantity of albumin in 100 cc. of fluid varies between 16 and 40 mg. (av. 25 mg.). It is usually increased in pathol. conditions. The authors give the albumin content found in a number of cerebrospinal diseases.

JAMES A. BRADLEY

The use of interferometry in biological problems. PAUL HIRSCH. *Naturwissenschaften* 10, 525-33(1922).—A review of recent accomplishments by use of the Lowe interferometer (*C. A.* 5, 1211). A bibliography is appended. C. C. DAVIS

The determination of the total oxygen-combining power of the blood in the Van Slyke apparatus. CHRISTEN LUNDGAARD AND EGERT MÖLLER. *J. Biol. Chem.* 52, 377-8(1922).—Six cc. H<sub>2</sub>O containing 2-3 drops octyl alcohol and 0.3 cc. 1% saponin are run into the apparatus. After evacuating, this liquid is drawn down and trapped in the wide part of the apparatus below the lower stopcock. Hg is then very slowly admitted to the upper chamber from the left tube and the liquid collected at the top is run out of the waste tube. Hg is then run into the cup and any H<sub>2</sub>O therein is removed with filter paper. Two cc. of blood are measured into the cup and drawn down almost to the bottom of the 50 cc. chamber. The apparatus is then shaken thoroughly to aerate the blood. Hg is again admitted to the apparatus, the blood being collected at the top. After closing the upper stopcock, the lower cock is opened to admit the air-free soln. which rises, mixes with and laves the blood. Satd. K<sub>4</sub>Fe(CN)<sub>6</sub> soln. is then added and the detn. completed in the usual manner. (Cf. Van Slyke, *C. A.* 10, 1257; Van Slyke and Stadie, *C. A.* 16, 728.)

I. GREENWALD

Aids to basal metabolic rate determinations. H. S. NEWCOMER. *Arch. Intern. Med.* 29, 748-62(1922).—A series of tables and charts to facilitate the calcn. of the basal metabolism and comparison with the normal, for a person of the individual's height and weight.

I. GREENWALD

A method for the direct determination of uric acid in urine. STANLEY R. BENEDICT AND ELIZABETH FRANK. *J. Biol. Chem.* 52, 387-91(1922).—Dil. the urine so that 10 cc. contains from 0.15 to 0.30 mg. uric acid. To this, in a 50 cc. vol. flask, add 5 cc. 5% NaCN and 1 cc. arsenotungstic reagent (*C. A.* 16, 2524), shake gently and, after 5 min., dil. to mark and compare with color similarly prepd. from a soln. contg. 0.2 mg. uric acid in 10 cc. This is conveniently prepd. every 10 to 14 days by dilg. 50 cc. of the standard of Benedict and Hitchcock (*C. A.* 9, 1626) with about 400 cc. H<sub>2</sub>O, adding 25 cc. 1:9 HCl and dilg. to 500 cc. The reaction mixt. is not heated, as is the case with blood, for there is enough uric acid present to enable one to use the equilibrium mixt. at the end of 5 min., instead of the completed reaction mixt. Good agreement with the methods of Benedict and Hitchcock and of Folin and Wu is reported. I. G.

Studies of acidosis. XVIII. Determination of the bicarbonate concentration of the blood and plasma. DONALD D. VAN SLYKE. *J. Biol. Chem.* 52, 495-9(1922).—

Accurate detns. of  $\text{BHCO}_3$  should be made under conditions existing in the body. For plasma or serum, correct results may be obtained by either (A) detg. the  $p_H$  by Cullen's colorimetric method (see following abstr.) and the total  $\text{CO}_2$  by Van Slyke's method (C. A. 11, 2208) and calcg. the  $\text{BHCO}_3$  from Hasselbach's equation, which may be written in the form  $[\text{BHCO}_3] = 1/(1 + 10^{pK' - p_H})[\text{CO}_2]$  and in which  $pK'$  has the value 6.10, or (B) the following: Treat 1 cc. of serum or plasma with NaCl soln. and indicator as described in following abstr. This is used as a standard. To another cc. of serum or plasma in a 100 cc. flask add 5 cc. 0.01 N HCl (in 0.9% NaCl), whirl flask for at least a min. to remove  $\text{CO}_2$ , pour into test-tube of same size as that used for the standard, rinse in with 10 cc. 0.9% NaCl (in 3 portions), add 7 drops 0.03% phenol red and then 0.01 N NaOH from a buret reading to 0.01 cc. until the color matches the standard. As the end-point is approached, 0.9% NaCl is added to bring the vol. to 20 cc. The calcn. is obvious.

I. GREENWALD

**Studies of acidosis. XIX. The colorimetric determination of the hydrogen-ion concentration of blood plasma.** GLENN F. CULLEN. *J. Biol. Chem.* 52, 501-15 (1922).—The blood is drawn without stasis and without exposure to air into a glass syringe or tube coated with  $\text{K}_2\text{C}_2\text{O}_4$  to give a concn. of 0.3% and contg. mineral oil. Then, without exposure to air, the blood is run under oil into a tube to complete filling of the tube. A one-hole rubber stopper is slipped into the tube, the oil being expelled over the blood through the hole. This is then closed with a glass plug and the tube is centrifuged. The plug is removed and, as the stopper is removed, oil is run in through the hole so as to keep the plasma covered with oil. The plasma is used immediately, or transferred, under oil to another tube. To 100 cc. 0.9% NaCl add 35 drops 0.03% phenol red (in calcd. amt. NaOH soln.) and from 1 to 3 drops 0.02 N NaOH to bring the reaction to  $p_H = 7.4$  or 7.5. 20 cc. portions are placed in suitable tubes and are covered with oil. One cc. of the plasma is delivered from a pipet, calibrated between marks, into the solu. below the oil and is mixed with this with a bent rod. Another cc. of plasma is measured into another tube containing 20 cc. NaCl soln. without indicator. The tubes containing the plasma and indicator and the standards of about the correct value are immersed in a bath for a few min. at  $20^\circ$  and are then compared in a comparator, having in one row, standard and plasma + NaCl soln. (no indicator) and, in the other, NaCl soln. and test (plasma + NaCl soln. + indicator). It is possible to read to 0.01 or 0.02  $p_H$ . The temp. is detd. by inserting a thermometer in the test soln. after the reading. Add 0.01 for each degree above  $20^\circ$ . To correct to  $38^\circ$  a specific correction must be added. This is 0.12 for horse plasma, 0.16 for horse serum, 0.23 for human plasma, 0.17 for rabbit plasma, 0.35 for dog serum and 0.21 for human joint fluid. The standards are prepd. from  $M/15$  solns. of  $\text{Na}_2\text{HPO}_4$  and of  $\text{KH}_2\text{PO}_4$  in ratios derived from Sørensen's curve. To obtain a series differing in  $p_H$  by 0.05 from 7.0 to 7.80, take 61.1, 63.9, 66.6, 69.2, 72.0, 74.4, 76.8, 78.9, 80.8, 82.5, 84.1, 85.7, 87.0, 88.2, 89.4, 90.5, and 91.5 cc. of  $M/15$   $\text{Na}_2\text{HPO}_4$  and dil. each to 100 cc. with  $M/15$   $\text{KH}_2\text{PO}_4$ . These solns. may be kept for weeks in the refrigerator. After the phenol red has been added, they change from 0.02 to 0.04 in a week. The tubes used must be of clear, non-alk. glass of uniform diam. (about 20 mm.). Daylight or light from a "daylight" lamp is required. The distd.  $\text{H}_2\text{O}$  used must not give a red color with either phenol red or methyl red. A 0.5% soln. of the  $\text{K}_2\text{C}_2\text{O}_4$  used should not be more alk. than  $p_H = 7.2$  or 7.4. Water shaken with the oil used must remain neutral. All glassware should be washed with tested  $\text{H}_2\text{O}$  and dried. The corrections to  $38^\circ$  were obtained by comparing the colorimetric detns. at  $20^\circ$  with electrometric detns. at  $38^\circ$ . The electrodes were prepd. by the method of Baker and Van Slyke (C. A. 12, 1983). Such electrodes may be used with other solns. for a long time but with plasma and blood, fresh electrodes should be used each day and after each 4 or 6 detns. There is apt to be a change which can be detected only by the

failure to obtain duplicate or consecutive readings that agree, although the same electrode may still give good results with phosphate soln. Such electrodes may be used after cleaning with cleaning mixt. without recoating.

I. GREENWALD

**A comparison of colorimetric and electrometric determinations of hydrogen-ion concentrations in solutions containing carbon dioxide.** G. E. CULLEN AND A. B. HASTINGS. *J. Biol. Chem.* **52**, 517-20(1922).—C. and H. standardized the system contg. the calomel electrode against a standard phosphate soln. of  $p_H = 7.4$  and then used this value in calcg. the  $p_H$  of solns. contg.  $\text{NaHCO}_3$ , equilibrated with  $\text{CO}_2$  at different tensions. The same solns. were used for colorimetric detns. of  $p_H$  by the method described in the preceding abstr., except that they were not dild. with  $\text{NaCl}$  soln. and identical results were obtained over the range from  $p_H = 7.27$  to 7.70. The claim of Evans (*C. A.* **15**, 2461) that the electrometric method gives too acid values with solns. contg.  $\text{CO}_2$  could not be confirmed.

I. GREENWALD

**The determination of globulins in blood serum.** R. R. HENLEY. *J. Biol. Chem.* **52**, 367-75(1922).—The method of Cullen and Van Slyke (*C. A.* **14**, 1690) was compared with the following methods: *A.*—To 10 cc. serum in 100 cc. vol. flask, add 60-70 cc. satd.  $\text{MgSO}_4$  soln., mix by rotation, add 12 g.  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$  and rotate occasionally until all is dissolved. Dil. to 100 cc. with satd.  $\text{MgSO}_4$  and, after standing overnight, filter and determine non-globulin N by Kjeldahl method in 20 cc. filtrate, equiv. to 2 cc. serum. Determine total N in another sample of serum. Difference = globulin N. *B.*—To 10 cc. serum in 400 cc. beaker, add 90 cc.  $\text{H}_2\text{O}$  and 100 cc. satd.  $(\text{NH}_4)_2\text{SO}_4$  soln. with stirring, and allow to stand overnight. Filter through 11 cm. hardened paper. Dissolve ppt. in funnel with 0.8%  $\text{NaCl}$  and receive filtrate in 100 cc. cylinder. Dil. to 100 cc., transfer to beaker, and reppt. globulin by adding 100 cc. (same cylinder) of satd.  $(\text{NH}_4)_2\text{SO}_4$  soln. Filter as before and again dissolve in 0.8%  $\text{NaCl}$ , now using about 300 cc. Heat to boiling, add 1-2 drops 10%  $\text{HOAc}$ , filter on hardened paper, wash with 200 cc. hot  $\text{H}_2\text{O}$ , dry at  $100^\circ$  and weigh in covered Al dishes. Results by any one of the 3 methods agree fairly well among themselves but they differ somewhat if different methods are used. Of the 3, *B* is least satisfactory, that of Cullen and Van Slyke is probably most accurate, being least affected by dilm., but *A* is nearly as accurate and very much more rapid and convenient.

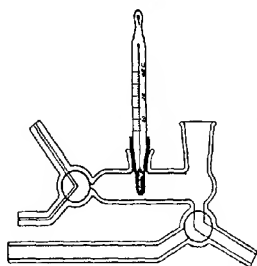
I. GREENWALD

**A colorimetric method for the determination of small amounts of magnesium.** A. P. BRIGGS. *J. Biol. Chem.* **52**, 349-55(1922).—To 1 vol. plasma add 3 vols.  $\text{H}_2\text{O}$  and 1 vol. 20%  $\text{CCl}_3\text{COOH}$ , mix, and filter on ash-free paper. To 15 cc. filtrate in 25 cc. Pyrex centrifuge tube, add 1.5 cc. soln.  $\text{KOAc}$  (Dissolve 125 g.  $\text{K}_2\text{CO}_3$  in as little  $\text{H}_2\text{O}$  as possible and let stand overnight. Filter, neutralize with  $\text{HOAc}$  and make up to 500 cc. Com.  $\text{NaOAc}$  and  $\text{KOAc}$  contain Ca or Mg) and 2 cc. satd.  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  and rub up and down with rubber-tipped rod until the  $\text{CaC}_2\text{O}_4$  appears to be completely pptd. Rinse off rod and heat tube in boiling  $\text{H}_2\text{O}$  for 15 min., cool, and centrifuge 5 min. at 2000 r. p. m. Pour off supernatant liquid into a 50 cc. centrifuge tube and add 1 cc. 2%  $(\text{NH}_4)_2\text{PO}_4$  and 5 cc. concd.  $\text{NH}_4\text{OH}$ . Rub sides of tube with rubber-tipped rod until pptn. appears to be complete. After allowing to stand for 3 or 4 hrs., centrifuge 10 min. at 1500 r. p. m. and pour off supernatant liquid. Rinse down sides of tube and half fill with soln. containing 200 cc. 95%  $\text{EtOH}$  and 50 cc. concd.  $\text{NH}_4\text{OH}$  per liter and centrifuge 5 min. Pour off and repeat washing. Dissolve ppt. in 5 cc.  $N$   $\text{H}_2\text{SO}_4$ , add 1 cc. 5%  $(\text{NH}_4)_2\text{MoO}_4$  in  $N$   $\text{H}_2\text{SO}_4$  and 1 cc. 2% hydroquinone, mix and, after 5 min., compare in colorimeter. [Apparently due to an error, there is no mention of the addn. of  $\text{Na}_2\text{CO}_3$ - $\text{Na}_2\text{SO}_4$  soln. ABSTR.] Cf. *C. A.* **14**, 3685 and following abstr.

I. GREENWALD

**The determination of magnesium in blood, plasma and serum.** W. DENIS. *J. Biol. Chem.* **52**, 411-5(1922).—Mg may be detd. by pptn. as  $\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$ , with subsequent detn. of the P by the method of Bell and Doisy, employing either (*A*) the

filtrate from the  $\text{CCl}_3\text{COOH}$  pptn. or (B) whole serum or plasma. A.—Evap. filtrate equiv. to 1.5 or 2 cc. of blood or serum almost to dryness, add 10 cc.  $\text{H}_2\text{O}$  and again evap. Add 10 cc.  $\text{H}_2\text{O}$  and ppt. Ca according to Lyman's directions (*C. A.* 11, 1440). Transfer the supernatant liquid and washings to a 100 cc. beaker and evap. to 2 cc. Add 0.5 cc. 5%  $(\text{NH}_4)_2\text{HPO}_4$  containing 5 cc. concd.  $\text{NH}_4\text{OH}$  per liter and 2 drops concd.  $\text{NH}_4\text{OH}$ . After 10 hrs., transfer to centrifuge tube and centrifuge for 5 min. Siphon off liquid and wash beaker and tube with 5 cc. of mixt. of 1 part concd.  $\text{NH}_4\text{OH}$  and 2 parts  $\text{H}_2\text{O}$ . Centrifuge again and siphon off liquid. Repeat twice. Five cc. of 75%  $\text{EtOH}$  containing 10 cc. concd.  $\text{NH}_4\text{OH}$  per liter is used for a fourth washing and then the residue in tube and beaker is allowed to stand in a warm place until all  $\text{NH}_3$  has evapd. Dissolve in 5 cc. 0.1  $\text{NHCl}$  and transfer, with aid of 5 cc. more 0.1  $\text{NHCl}$ , to 25 cc. vol. flask and complete detn. by the method of Bell and Doisy (*C. A.* 14, 3685), using a standard contg. 0.02 mg. Mg in 10 cc. prepd. by dissolving  $\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$  in 0.1  $\text{N HCl}$ . B.—Two cc. serum are measured into a conical centrifuge tube and 1 cc. 3%  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  is added, with stirring. After standing overnight, centrifuge and pipet off 2 cc. of the supernatant liquid into a 15 cc. centrifuge tube, add 0.5 cc. 5%  $(\text{NH}_4)_2\text{HPO}_4$  containing 5 cc. concd.  $\text{NH}_4\text{OH}$  per liter, let stand overnight, centrifuge and complete detn. as described above. Either method is accurate to within  $\pm 5\%$ . I. G.



A modification of the Clark hydrogen electrode vessel to permit accurate temperature control. GLENN E. CULLEN. *J. Biol. Chem.* 52, 521-4 (1922).—A thermometer is inserted through an extra opening in the Clark electrode vessel (see sketch). It is important that the bulb be small so as not to obstruct the flow of liquid or create a dead space. I. GREENWALD

Theobromine excretion and diuresis. I. GÜNZBERG. *Biochem. Z.* 129, 549-62 (1922).—Theobromine was detd. in the urine by making strongly acid, adding gypsum and drying on the water-bath to a powder. Further drying at  $100^\circ$  in an oven for

2 hrs. and then in a vacuum desiccator over  $\text{H}_2\text{SO}_4$  was employed. The resultant powder was extd. with  $\text{H}_2\text{O}$ -free  $\text{CHCl}_3$  for 2 hrs. protected by a  $\text{CaCl}_2$  tube. The  $\text{CHCl}_3$  is then distd. off, the last traces being removed by repeated evapn. of a few drops of petroleum ether. The residue of urinary pigments and some lipid material covers the bottom of the flask while the theobromine as free base and methylxanthine lie on the edge as a white cryst. ppt. The  $\text{CHCl}_3$  residue is dissolved in a few cc. concd.  $\text{NH}_4\text{OH}$ , distd.  $\text{H}_2\text{O}$  is added to a total vol. of about 20 cc. and the excess  $\text{NH}_3$  is removed by aeration. The soln. is then transferred quant. to a 50 cc. flask, a measured vol. of 0.02  $\text{N AgNO}_3$  is added (usually 10 cc.) and the flask is filled to the mark, shaken and allowed to stand in the dark for 10 min. Ag theobromine ppts. out and is filtered through a dry filter into a dry flask. Twenty cc. of the filtrate are titrated with 0.02  $\text{N NH}_4\text{CNS}$  soln., with  $\text{Fe-NH}_4$  alum soln. as indicator. If free  $\text{NH}_3$  is in the soln.  $\text{Fe}(\text{OH})_3$  is pptd. when the indicator is added, and the detn. must be discarded. Each cc. of 0.02  $\text{N AgNO}_3$  soln. is equiv. to 3.6 mg. theobromine. Using this method G. found that after administration of the drug, the excretion of theobromine in man followed a characteristic curve with a steep rising slope having its max. within 2 or 3 hrs. and a rapid falling off. This curve obtains even when diuresis is present. At the point of max. theobromine excretion the urine is usually alk. though it may be weakly acid. The diuresis is decreased by alk. administration and increased by acid. Chronic caffeine ingestion decreases the sensitivity to theobromine so that large doses are necessary to produce diuresis. F. S. HAMMETT

**Precise determination of urea in blood.** R. DOURIS. *Bull. sci. pharmacol.* 29, 238-41(1922).—Description of an app. and procedure for the detn. of urea by the hypobromite method. F. S. HAMMETT

**Quantitative methods for estimating bilirubin in blood.** PAUL HOLZER AND HEINZ MEHNER. *Klin. Wochschr.* 1, 66(1922).—This article contains a detailed description and critical comparison of the methods of H. v. d. Bergh (*Der Gallenfarbstoff im Blute*, Leipzig (1918)), G. Haselhorst (*C. A.* 15, 3648) and E. Meulengracht (*C. A.* 14, 572) for the quant. estn. of bilirubin in blood. The authors conclude that the method of Meulengracht is worthless for the estn. of small amts. of bilirubin and unreliable for the estn. of large amts. To obtain accurate results it is necessary to enhance the bilirubin color by diazotization with *p*-phenyldiazonium sulfonate in alc. soln. (direct diazotization). Of the methods that make use of this diazotization reaction, that of H. v. d. Bergh gives the most reliable results over the entire range of values found in various diseased conditions. Small concns. of bilirubin cannot be accurately detd. by the method of Haselhorst. MILTON HANKE

**Modifications of apparatus and improved technic adaptable to the Benedict type of respiration apparatus.** III. Graphic method for the estimation of the metabolic rate. PAUL ROTH. *Bost. Med. Surg. J.* 186, 491-8(1922).—The adaption of a kymograph to the spirometer type of respiration app. designed by Benedict for the detn. of metabolic rate makes possible greater accuracy through the possibility of better controlling or verifying the most important conditions which must be insured during a test in both subject and apparatus. IV. Moisture-absorbing efficiency of carbon-dioxide absorbents. *Ibid* 498-501.—In the detn. of the metabolic rate by means of the respiration app. (spirometer type) the absorption of moisture from the circulating air must be insured. A good absorbent for CO<sub>2</sub> may have a low moisture absorbing power. A good CO<sub>2</sub> absorbent used with an efficient moisture absorbent makes an ideal combination. An av. correction of 2% should be made if the circulating air is maintained at a high degree of moisture content. JULIAN H. LEWIS

**The use of collargol in investigating liquor cerebrospinalis.** PHILLIP HELLINGER. *Berl. klin. Wochschr.* 58, 1001-3(1921).—Collargol is used to replace the various colloids used in other tests to study the changes in cerebrospinal fluid. JULIAN H. LEWIS

**A portable respiration apparatus for clinical use.** FRANCIS G. BENEDICT. *Boston Med. Surg. J.* 178, 667-78(1918).—This app. consists mainly of a spirometer which contains O and which registers the amt. of O used by a patient breathing into it. The CO<sub>2</sub> and H<sub>2</sub>O in the exhalations are absorbed by suitable materials. Within the spirometer is an electrically driven device for keeping the air in motion. It is claimed that the app. has the advantages of simplicity, portability and rapidity of operation, with a sufficient degree of accuracy to meet the needs of practically all clinical work. J. H. L.

**Comparative researches on the detection of occult blood in the feces by the Gregersen benzidine reaction as modified by Boas.** ARNO. DIENSTFERTIG. *Berl. klin. Wochschr.* 58, 1183-4(1921).—For the detection of occult blood in the feces the Boas modification of the Gregersen benzidine reaction is recommended (*Arch. f. Verdauungsheilkh.* 27, No. 1(1920)). JULIAN H. LEWIS

**A clinical apparatus for measuring basal metabolism.** FRANCIS G. BENEDICT AND WARREN E. COLLINS. *Boston Med. Surg. J.* 183, 449-53(1920).—To fill the urgent clinical needs the portable respiration app. has been modified, reduced in wt., and provided with support and stand to make it a strictly portable app. Without gas analysis, without weighings of any kinds, the O consumption of patients may be studied in the customary 10-15 mins. periods, with an accuracy fully equal to other standard methods of studying respiratory exchange. A simple method of timing the readings of the position of the spirometer bell eliminates the use of stop-watches. Three series.

of comparison tests on 2 different subjects with widely varying basal O requirements show that the most satisfactory results can be obtained.

JULIAN H. LEWIS

**Notes on the use of the portable respiration apparatus.** FRANCIS G. BENEDICT. *Boston Med. Surg. J.* **182**, 243-5(1920).—Advice is given on the mech. management and care of the Benedict portable respiration app. Attention is called to impossibility of using an app. of this sort clinically by interpreting the results obtained by comparing the measured O consumption with preconceived values. *There is no inflexible standard for normal metabolism for any given age, wt., height, and sex, from which all normal individuals never vary.* The present commonly accepted limits of clinicians, 10% below or above normal, is strongly condemned.

JULIAN H. LEWIS

**Detection and determination of nitrate nitrogen in the urine and in liquid manure.** O. NOLTE. *Landw. Versuchsst.*; *Z. anal. Chem.* **61**, 278-82(1922).—The  $\text{FeSO}_4$ -addition reaction for  $\text{NO}_3^-$ , although not as sensitive as the diphenylamine reaction, was found to be the more specific in highly colored fluids contg. a number of interfering substances. Of various methods for the detn. of  $\text{NO}_3\text{N}$  only the gasometric method of Schlösing and Grandeau (*Hempel. Gasanalyt. Methoden*, 1900, 141) gave reliable results when applied to urine and liquid manure.

W. A. PERLZWEIG

**Proposal of a system of qualitative analysis of protein substances of the urine.** EMILIO CAVAZZANI. *Wiener klin. Wochschr.* **34**, 121-2(1921).—C. urges a more thorough system of testing urine proteins than is usually employed. In order to differentiate the various protein substances which occur in urine, he proposes the following system: (1) Addn. of equal vol. of 15% soln. of sulfosalicylic acid. Pptn. or cloudiness indicates presence of protein. (2) Addn. of solid  $\text{MgSO}_4$  produces pptn. of *globulin*. In a strongly acid soln. albumin,  $\text{CaSO}_4$  and  $\text{Mg}_3(\text{PO}_4)_2$  will also ppt. To control this, the ppt. is filtered, redissolved in dil. NaOH and repptd. by passing a current of  $\text{CO}_2$  through the soln. The filtrate from the last ppt. is saved for reactions 4 and 6. (3) (a) 2.8 (b) 3.5, (c) 5.0 cc. satd.  $(\text{NH}_4)_2\text{SO}_4$  soln. are added, resp., to (a) 7.2, (b) 6.5, (c) 5.0 cc. of urine at room temp. Pptn. denotes presence of: in (a) *fibrinogen*, in (b) *euglobulin*, in (c) *pseudoglobulin* (ammonium urate may also be pptd. by  $(\text{NH}_4)_2\text{SO}_4$ ). (4) Addn. of AcOH to filtrate from 2 and heating. *Albumin* if present forms a coagulum or turbidity. The presence of albumin is further confirmed by protein color tests. (5) Addn. of  $\text{HNO}_3$  and warming. The appearance of a ppt. in the cold which disappears on warming and reappears on cooling indicates presence of *proteoses* in general and of *Bence-Jones proteose* under certain conditions. Differentiation of the proteoses is possible only by biol. methods. (6) Addn. of AcOH to a portion of filtrate from 2. In presence of *nucleoprotein* a flocculent ppt. appears, while *mucin* ppts. in threads insol. in an excess of AcOH. (The nucleoprotein and mucin may be conclusively differentiated by testing the ppt. for P.) (7) Heating in an acid reaction to 50-60°. If a ppt. appears which (a) redissolves in an excess of AcOH the presence of *AcOH-sol. albumin* is indicated; (b) if it redissolves in an excess of HCl *nucleohistone* or *histone* is indicated. Histone is identified by pptn. with  $\text{NH}_4\text{OH}$  after hydrolyzing the nucleohistone with HCl. (8) The production of violet color on addn. of  $\text{CuSO}_4$  to urine made alk. indicates presence of *peptone* which should be further confirmed by a positive biuret reaction on filtrate from urine satd. with  $(\text{NH}_4)_2\text{SO}_4$ . (9) The addn. of  $\text{FeCl}_3$  to urine freed of phosphates produces a flocculent ppt. in the presence of *ferrinucleon* (carniferin). (10) The Teichman test for *hemoglobin* (or spectroscopic test for hemoglobin and derivs.).

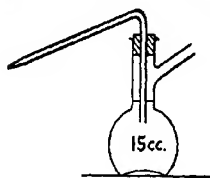
W. A. PERLZWEIG

**The determination of non-protein nitrogen by means of ultrafiltration.** M. RICHTER-QUITTNER AND H. HOENLINGER. *Wiener klin. Wochschr.* **34**, 24(1921).—Twenty cc. of blood plasma or serum are dild. 10-20 times with distd.  $\text{H}_2\text{O}$  and filtered through a Zsigmondi-ultrafilter (cf. *C. A.* **14**, 703) which may be improvized by using a Buchner

funnel and membrane. The non-protein N detd. on the filtrate by the Kjeldahl or Pregl's micro-method gave figures closely comparable to those obtained when using  $\text{CCl}_3\text{COOH}$  filtrates.

W. A. PERLZWEIG

**Bang's micro-sugar determination in the blood.** The measurement of the blood without the use of a torsion balance. Z. ERNST AND ST. WEISS. *Wiener klin. Wochschr.*



34, 174-5(1921).—The blood sample of 0.115 cc. is aspirated by means of a calibrated capillary pipet which is attached to a 15 cc. flask as shown in the fig. The pipet is rinsed into the flask by aspirating through it some of Bang's dilg. salt soln. The stopper and pipet are removed, the flask is filled with the salt soln. to the mark, the contents are mixed, filtered and 13 cc. of the filtrate, corresponding to 0.1 cc. of blood, is analyzed by the usual Bang titration (C. A. 12, 2333). Instead

of the filtration centrifugalization may be employed.

W. A. PERLZWEIG

**New method for the determination of calcium and thrombin in a serum.** JOHN BAUER AND KATHRYN NARNICKOL. *J. Am. Med. Assoc.* 78, 1041(1922).—The object of this study was "to advance a method of detn. of available (ionizable) Ca in fresh serum, and at the same time to express in terms of Ca the amt. of thrombin present." The original paper must be consulted for the method and technic of making tests. The method depends on the detn. of the time of coagulation. Comparisons are made with citrated plasma of sheep blood contg. varying amts. of  $\text{CaCl}_2$ .

L. W. RIGGS

**Specific precipitin test for human semen.** LUDWIG HEKTOEN. *J. Am. Med. Assoc.* 78, 704-5(1922).—Injection of rabbits with human semen induces the formation of precipitins that are sp. for human seminal proteins. This precipitin reaction may prove of value in detg. the nature of spots suspected to be of seminal nature.

L. W. R.

**Comparison of several clinical quantitative blood sugar methods.** WILLIAM THALHIMER AND HELEN UPDEGRAFF. *J. Am. Med. Assoc.* 78, 1383-8(1922).—Comparative blood sugar detns. were made by the Myers-Bailey modification and Benedict modifications of the Lewis-Benedict and by the latest Polin-Wu methods. The results show that the blood sugar percentages as detd. by the Benedict modification are as a rule at a higher level than those detd. by the Myers-Bailey modification, and the latter higher than those detd. by the method of Polin and Wu. In interpreting the blood sugar findings obtained in any lab., the clinician should be advized of the method employed in the lab. in question, and also of the range of normal figures for the method in this lab. The 3 methods above mentioned are on practically an equal footing as regards simplicity of technic.

L. W. RIGGS

**Effect of acid on ciliary action as a class exercise in  $p_{\text{H}}$ .** J. M. D. OLNSTEAD AND J. W. MACARTHUR. *Science* 55, 625-6(1922).—In the majority of college labs. potentiometer methods are out of the question for student work. The colorimetric method was used successfully, the expt. being stated in the form of a problem, thus: "Find the concn. of acid which will stop ciliary action within approx. 3 min." A small piece of ciliated epithelium from the frog's esophagus is placed on a slide, and while one student observes this under low power of the microscope, the other places upon the tissue a few drops of acid and records the time. When that concn. of acid has been found which stops the movement of cilia in 3 min., an indicator is added in correct proportion (Clark '20, p. 40) and the  $p_{\text{H}}$  detd. by matching the resulting color with the appropriate color in the color chart. Ordinary distd. water is decidedly acid,  $p_{\text{H}} = \approx 6.3$ . In it, cilia cease to beat in approx. 30 min. In 0.7% NaCl the beating continues for a day, and in Ringer soln. for 3 or 4 days at room temp. For purposes of accuracy the acid should be added to normal saline or Ringer soln. but for class practice



distd. water may be used. In order to obtain comparable results the pieces of epithelium must be taken from corresponding regions of the frog. Cilia from posterior regions of the esophagus beat longer than those from anterior regions. I. W. RIGGS

**Micro-method for the determination of sugar in small amounts of blood.** H. O. POLLOCK AND W. S. McELROY. *Am. J. Med. Sci.* 163, 571-6(1922).—The reagents employed in the method of Folin and Wu are used and indeed the method is simply their technic applied to 0.2 cc. of blood. G. H. S.

**The urea concentration test.** DONALD R. BLACK. *Am. J. Med. Sci.* 163, 218-23 (1922).—After the ingestion of 15 g. of urea 2% should be eliminated by way of the kidney within 2 hrs. A lower figure indicates kidney disturbance. When compared with other tests (sp. gr., phenolsulfonephthalein elimination) it appears that this test is of particular value in the diagnosis of early cases where there is a high blood pressure. G. H. S.

**Registration of the respiratory rate in small animals.** WERNER TESCHENDORF. *Arch. expil. Path. Pharm.* 92, 335-8(1922).—App. is described for recording the respiratory rate of mice and frogs. G. H. SMITH

**Critical study of the isolation of biliary acids.** G. MEILLÈRE. *J. pharm. chim.* 25, 417-23(1922).—The best clinical method is that of absorption with washed bone black or blood charcoal. Evap. 100 cc. of urine with 5 g. of moist charcoal to dryness, remove urinary pigments with 50 cc. of 20%  $\text{NH}_4\text{OH}$ , filter and wash first with 5%  $\text{NH}_4\text{OH}$ , then with  $\text{H}_2\text{O}$ . Dry, then ext. the charcoal with 50 cc. of hot 95%  $\text{EtOH}$ , filter, wash with boiling  $\text{EtOH}$  and evap. to dryness. Dissolve the residue in 10 cc. of 1%  $\text{Na}_2\text{CO}_3$  and apply the drop test, using the Duclaux drop counter, or apply the following color test: Dissolve the residue in about 3 cc. of 50%  $\text{H}_2\text{SO}_4$  in a wide dish, and place upon the edge of the liquid a pinch of sugar. Then warm to  $60^\circ$  until a carmine color is formed around the sugar. Moisten it with new portions of the warm liquid, thus obtaining a max. color intensity after 1 hr., which is permanent for 24 hrs. and may be used in colorimetric or spectroscopic exams. To detect biliary acids in blood, add to 10 cc. of total blood, 50 cc.  $\text{Me}_2\text{CO}$  and a few drops of  $\text{CCl}_3\text{CO}_2\text{H}$ , express the coagulum and wash with 30 cc.  $\text{Me}_2\text{CO}$ . To the evapd. residue apply Pettenkofer's furfural test, or dissolve it in 50 cc.  $\text{H}_2\text{O}$  and purify as above, with 3 g. of charcoal. S. WALDBOYD

**Use of double ferrocyanide of zinc and potassium as a defecating agent for blood; application to the determination of sugar in glucemia.** THIÉRY. *J. pharm. chim.* 25, 209-14(1922).—To 5 cc. of plasma add 5 cc.  $\text{H}_2\text{O}$ , then 2 drops of glacial  $\text{AcOH}$ , 2 cc. of soln. A (C. A. 16, 111), 2 cc. of soln. B, stir well, complete to 50 cc. and filter. To the filtrate apply the method of Lewis and Benedict for the detn. of sugar. In 9 samples, the results were on an av. 0.13 g. per l. higher than those by Bertrand's method (max. deviation + 0.43; minimum - 0.06). S. WALDBOYD

## C—BACTERIOLOGY

A. K. BALLS

**Proteolytic activity of lactic organisms. V. Phenomena of sudden physiological mutation.** CONSTANTINO GORINI. *Atti. accad. Lincei* 30, i, 312-5(1921); cf. C. A. 12, 1991.—Observations indicate that lactic acid organisms are capable of exhibiting sudden and spontaneous mutation and retro-mutation in their acidifying and proteolytic activity; the new properties acquired in this way are transmissible independently of the conditions of development. These phenomena do not, however, apply to a culture as a whole, but only to certain fractions of it, so that they may be regarded as resulting from simple variations related to inevitable individual divergences of the bacterial cells of one and the same species. Thus; such mutations are not abnormal

but rest on fortuitous seeding composed exclusively, or almost so, of cells of one type. Cf. C. A. 15, 3656. J. C. S.

**Formation of soluble starch in elective nitrogen metabolism.** F. BOAS. *Ber. bot. Ges.* 37, 50–6(1919); *Physiol. Abstracts* 6, 161; cf. C. A. 14, 3443.—*Aspergillus niger* produces sol. starch from saccharose, dextrose, or maltose with 5%  $\text{NH}_4\text{Cl}$  if the  $p_{\text{H}}$  is 2.25, 1.85, and 1.57, resp., and the temp.  $32^\circ$  to  $33^\circ$ . By the use of I the intensity of sol. starch can be roughly detd., and thus give a guide to the H-ion concn. of the soln. By this means it was detd. that if a number of nitrogenous compds. are available, the fungus absorbs the more highly dissociated one even when the resulting products are strongly poisonous. H. G.

**Auto-intoxication in *Aspergillus niger*.** F. BOAS. *Ber. bot. Ges.* 37, 63–5(1919); *Physiol. Abstracts* 6, 162.—B. has previously described the death of *Cladosporium*, which may be brought about by the production of  $\text{NH}_3$  when it is growing on a medium contg. urea. A similar alkyl. of the medium with the production of  $\text{NH}_3$  and amines is to be observed when *Aspergillus niger* grows on a medium contg. maltose (5%) and urea (2%). H. G.

**Asparagine as a source of nitrogen for typhoid bacilli.** G. GASSNER. *Centralbl. Bakteriol. Parasitenk., Abt. I, Orig.* 80, 258–64(1918); *Abstracts Bact.* 4, 109.—Asparagine may be used as a source of N not only by *B. coli*, but by *B. typhosus*, *B. paratyphosus* A and B and the dysentery strains. There is a quant. difference in the availability of asparagine for these strains. H. G.

**The disinfecting action of hydrocyanic acid.** E. V. SKRAMLIK. *Centralbl. Bakteriol. Parasitenk., Abt. I, Orig.* 83, 386–91(1919); *Abstracts Bact.* 4, 142.—Slant agar cultures of the organism *Vibrio cholerae*, Shiga-Kruse bacillus, staphylococci, paratyphoid B, fowl cholera, Flexner and Y bacilli were exposed to HCN gas for 24 hrs. The asiatic cholera, Shiga-Kruse, dysentery and fowl cholera organisms were killed, and there was some inhibition of growth with staphylococci, Flexner and Y bacilli. Evidently HCN is not particularly destructive to microorganisms. Studies were also made with yeast and air bacteria dried on filter paper. In general, yeasts were destroyed while the number of bacteria of air types were materially reduced. H. G.

**Peat as a source of energy for nitrogen-assimilating bacteria.** E. W. SCHMIDT. *Cent. Bakt. Parasitenk., Abt. II* 52, 281–9(1920); *Physiol. Abstracts* 6, 229.—Peat, after treatment with HCl and subsequent neutralization, gives an excellent substratum for the growth of azotobacter. H. G.

**Effect of iron on the chromogenic power of *B. bruntzii*, nov. sp.** F. NÉPVEUX. *Compt. rend. soc. biol.* 83, 742–3(1920); *Physiol. Abstracts*, 6, 229.—This bacillus develops a red pigment only in presence of Fe in the culture medium. H. G.

**Acclimatization of brewer's yeast to arsenic.** J. EFFRONT. *Compt. rend. soc. biol.* 83, 806–7(1920); *Physiol. Abstracts* 6, 161; cf. C. A. 15, 3299.—By gradual acclimatization brewer's yeast can be made to tolerate 3 times the concn. of As that originally would have proved fatal, the yeast producing a substance ( $\text{H}_2\text{S}$  in the case of some races) which inhibits the action of the As. H. G.

**Acclimatization of microorganisms to toxic substances.** J. EFFRONT. *Compt. rend. soc. biol.* 83, 807–9(1920); *Physiol. Abstracts* 6, 161; cf. C. A. 15, 3299.—The acclimatizing of microorganisms to poisons depends on the production of a substance which removes the poison (cf. preceding abstr.). H. G.

**Ammonia as a product of protein transformation caused by mold fungi and the conditions of its formation.** V. S. BURKEVICH. *Rec. d'articles dédiés au Prof. C. Timiriazeff* 1916, 457–99; *Abstracts Bact.* 4, 36.—The different species of fungi vary as regards their capacity to decompose proteins with formation of  $\text{NH}_3$ . The mold fungi are capable of utilizing for the formation of  $\text{NH}_3$  not only amino- but also the amido-

complexes. Both of these reactions were studied, both with the mycelium and the expressed juice of *Aspergillus niger*. This fungus contains an enzyme which is capable of transforming the amido-group of asparagine to  $\text{NH}_3$ . An alk. medium is most favorable for its action. The ammonification of the  $\text{NH}_3$  group of amino acids can only be observed with living cells.

H. G.

**Heterogeneous sheep-blood antigens.** K. MEYER. *Biochem. Z.* 129, 187(1922).—Correction of a citation in *Biochem. Z.* 122, 225(*C. A.* 16, 959). F. S. HAMMETT

**The relation of the heterogeneous sheep-blood antigens to other lipid antigens.** K. MEYER. *Biochem. Z.* 129, 188-9(1922).—M. gives a 3rd example of an antigen action of lipoids, by testing, with horse kidney immune serum, tubercule bacilli immune serum and tape-worm immune serum, the cephalin obtained from each. The tabulated results show the dissimilarity of the 3 lipoids and the marked specificity of their homologous antigen.

F. S. HAMMETT

**The physical chemistry of the reactions of complement fixation.** J. KISS. *Biochem. Z.* 129, 487-502(1922).—Expts. are reported which demonstrate that the various forms of complement fixation, the non-specific as well as the specific, follow the formula of phys. adsorption. The value of the exponent  $m$  ranges from 0.74 to 0.82. The nature of the adsorbent and the constitution of the medium simply influences the intensity of fixation not its character. Specific fixation is no exception. The previous contention that complement fixation is only possible after fixation of immune body and antigen only happens with the blood corpuscles. In general the antigens and other substances, which take on the role of antigens (organ exts.), are to be considered as adsorbents, the adsorption power of which is particularly increased by specific substances or reactions. These latter often coincide with changes in dispersion. These changes in dispersion (flocculation, pptn., agglutination) contribute to complement adsorption.

F. S. HAMMETT

**The formation of bacterial toxins. I. Staphylolysin.** L. E. WALBUM. *Biochem. Z.* 129, 367-443(1922).—The electrometric detn. of the  $p_H$  in bacterial nutrient media is not difficult when the  $p_H$  is low, i. e., 6.0, but in neutral or alk. cultures much difficulty is often experienced from the fact of the production of volatile compds. such as  $\text{NH}_3$ , S compds., etc., produced by warming or bacterial growth. When the bouillon has not been sterilized by heat the  $p_H$  detn. is not difficult; in such cases the results are comparable with those obtained colorimetrically. Colorimetric detns. showed that the  $p_H$  of warmed bouillon falls with increase in temp. This reaction occurs more markedly in the alk. media and decreases with decreasing alky. It is the same for different peptone-bouillon preps. made at different times and is the same in different stages of development of staphylococcus and diphtheria bacillus on this medium and for their filtrates (toxins). The studies of the growth of staphylolysins showed that at a favorable temp. growth occurs between  $p_H$  4.5 and 9.8. Higher and lower temps. narrow the range of  $p_H$ . At 48° the range is  $p_H$  4.9 to 8.7; at 10.5° it is 5.2 to 7.5. The optimum  $p_H$  is 6.5 for temps. from 10.5° to 48°; the temp. optimum is between 34° and 36°, though the range is extended from 26° to 44° at the optimum  $p_H$ . During growth the  $p_H$  falls and then gradually becomes alk. The lysin formation first rises and then decreases. An increase in temp. facilitates this. In cultures of high alky. no lysin or only small amts. are found. It first appears when the  $p_H$  is between 8 and 9 and increases with increasing acidity of the bouillon. The optimal  $p_H$  for lysin stability is around 6.0. At 40° no lysin destruction occurs under these conditions; in 6 days at 45°, 50% is destroyed. At  $p_H$  above 8 to 9 and below 4 the lysin loss is total. The optimal time for lysin production is dependent on the temp. and the initial  $p_H$ . The temp. optimum is around 40°; the  $p_H$  optimum is about 5.0 or 6.0 to 7.0. Further studies showed that  $\text{K}_2\text{HPO}_4$  is of great importance for growth and  $\text{MgSO}_4$  for lysin formation. Moreover it is the

peptones and amino acids of the Witte peptone that facilitate lysin formation, not the albumoses. The concn. of peptone in the medium does not seem to play a great part in lysin formation although production velocity is greater in the cultures of low concn. The concn. of NaCl is of great importance, since lysin production decreases with increasing salt concn. Since sterilization of the medium tends to increase the  $p_H$  particularly of alk. mixts. it is essential that the  $p_H$  be detd. after this process and the reaction corrected with acid or alk. The effect of various salts on lysin production was studied. Salts of Mg, Ni, Mn, Au and Pt favor the reaction; Ca salts act as inhibitors.

F. S. HAMMETT

**Bactericidal action of rabbit bile on certain strains of streptococci.** RUTH L. STONE. *Am. J. Hyg.* 2, 67-76(1922).—Rabbit bile kills strains of *Streptococcus pyogenes*, the action being peculiar to rabbit bile, since horse, sheep, beef, dog, cat, turtle, guinea pig, and human bile were without action. The bactericidal action is not a lytic process and the active principle is present in the alc.-sol., ether-insol. fraction. It is thermostable and is not adsorbed from the bile by bacteria.

G. H. S.

**The bactericidal action of pyromucic acid.** H. P. KAUFMANN. *Ber.* 55, 289-90 (1922).—A 0.5% soln. of pyromucic acid destroys *B. coli* in 5 min.; a 0.25% soln. in 30 min.; a 0.1% soln. in 7 hrs. *Staphylococcus aureus* is more resistant. Salts of this acid are only slightly bactericidal. Pyromucic acid is much like benzoic acid in bactericidal action but not so well adapted for use in food preservation.

F. W. T.

**Influence of arsenious acid on bacterial growth.** R. COBET AND V. VAN DER REIS. *Biochem. Z.* 129, 73-88(1922).—Arsenious acid when placed in the center of agar plate cultures always shows a sterile zone in its immediate vicinity. Around this is an area of luxuriant growth, not caused by the presence of the arsenious acid but by the character of the medium. The same may be observed with a silver coin in the center of an agar plate. The increase of bacterial growth does not result from the presence of arsenious acid.

F. W. T.

**Standardization of disinfectants.** F. CRONER. *Chem.-Ztg.* 46, 470(1922).—Discussion of paper by Grempe (*C. A.* 16, 2010).

F. W. T.

**Relation between chemical constitution and antiseptic action in the coal-tar dye-stuffs.** T. H. FAIRBROTHER AND A. RENSHAW. *J. Soc. Chem. Ind.* 41, 134-44(1922).—This paper is largely covered by *C. A.* 16, 1601. Present paper contains chem. formulas of dyestuffs showing relation to bactericidal properties. Technic for detg. this is given.

F. W. T.

#### D—BOTANY

B. M. DUGGAR

**The biology and microchemistry of some species of *Pirola*.** P. FÜRTH. *Sitzb. Akad. Wiss. Wien., Abt. I* 129, 559-87(1920).—Two species, *P. chlorantha* and *P. uniflora*, were studied. Biol. and anatomical features are described. Phloroglucotannin compds. are found in *Pirola* in considerable amts. The aerial parts of *P. uniflora* contain an org. combination which can be destroyed by  $H_2O$  or  $Et_2O$  treatment and which by sublimation is readily obtained in cryst. form. Its chem. nature is not known.

F. C. COOK

**Do plants have hormones?** A. TSCHIRCH. *Vierteljahrs. Naturforsch. Ges. Zürich* 66, 201-11(1921).—A general discussion. No exptl. data.

F. C. COOK

**The reserve material in the pollen of certain wind-pollinated families of plants.** H. BODMER. *Vierteljahrs. Naturforsch. Ges. Zürich* 66, 339-46(1921).—In *Fraxinus* the change of fat to starch takes place more rapidly in moist than in air-dried pollen grains. In the family to which this genus belongs the pollen-contg. starch germinates in a warm damp room as well as that free of starch. More importance is attached to

the quantity than to the quality of the reserve material of pollen, whether starch or fat. In *Plantago lanceolata* and *Rumex scutatus* nourishment is absorbed from a 5% dextrose soln. They developed rapidly and the starch disappeared slowly. The H<sub>2</sub>O content of air-dried pollen is very low and the grains become transparent in xylene. In a number of wind-pollinated families the air-dried pollen develops an osmotic pressure equal to 3-4 g. mols. of NaCl. F. C. COOK

Electroosmotic processes in plasmolysis. R. COLLANDER. *Arch. ges. Physiol.* (Pflüger's) 185, 224-34(1920); *Physiol. Abstracts* 6, 110.—Electrolytes which (like acids, Na citrate, salts of Al and La) give abnormal osmosis with dead membranes behave normally with regard to the plasmolysis of cells of the epidermis of *Rhoeo*. E. J. C.

New Euglenaceae. J. GICKELHORN. *Oesterr. bot. Zeit.* 69, 193-9(1920); *Physiol. Abstracts* 6, 224.—The description of a new species includes the results of a microchem. examn. E. J. C.

Hydra and alga in a new cell symbiosis. W. GOETSCH. *Naturwissenschaften* 10, 202-5(1922).—A probable case of symbiosis was found in an undetd. form of hydra from the Botanical Gardens of Nymphenburg. This hydra had characteristics similar both to *Hydra attenuata* and to *Hydra vulgaris* and was not *Hydra fusca* or *Hydra grisea*. The alga was similar to those pertaining to *Chlorohydra viridissima*. The color changed from brown to green, beginning between the tentacles and spreading in 2 weeks over the entire body with an intense green. This change was accompanied by pathological conditions, such as a reduction in size and a cessation of bud formation. The green color disappeared either by keeping the hydras in darkness or by cold. After 4 weeks of darkness the color could not be restored, but always could be after cooling. A passive state did not exist between hydra and alga, for if the hydra was in an abnormal condition due to hunger, depression or propagation it succumbed to the alga. But the growth of the symbiotic alga was suppressed when the hydra was kept highly nourished. C. C. DAVIS

Photocatalysis in plants. KARL. BORESCH. *Naturwissenschaften* 10, 505-12 (1922).—A survey of present knowledge of all plant reactions dependent directly or indirectly upon light, including an extensive bibliography. C. C. DAVIS

Carrageen, *Chondrus crispus*. P. HAAS AND T. G. HILL. *Ann. Appl. Biol.* 7, 352-62(1921); *Physiol. Abstracts* 6, 158; cf. C. A. 15, 3865.—A preliminary general account of carrageen, including notes on its phys. and chem. properties. H. G.

Problem of the cells of the Cyanophyceae. O. BAUMGRÄTEL. *Protistenk.* 41, 50-148(1920); *Physiol. Abstracts* 6, 228-9.—The protoplast in the Cyanophyceae consists of 2 parts, chromatoplasm and a hyaline centropiasm. The former contains a mixt. of chlorophyll, phycocyan, and carotin as assimilation pigments distributed diffusely as in many Chlorophyceae—e. g., *Hydrodictyon*—but it can sometimes exist as tiny granules (Meyer's granules). The centropiasm is the ground substance, in the alveoli of which seps. the third component in the form of various plastids, endoplasts, epiplast, and ectoplasts. The first form the chief part of the plastids lying in the centropiasm, and are composed of a mixt. of glucoproteins and P-contg. proteins. The epiplast arise at the periphery of the endoplasts, in which with optimal assimilation conditions carbohydrate combines with the substance of the endoplasts, and so consist of highly condensed nucleoglucoprotein in the form of a shell about a nucleus of protein character. The ectoplasts consist chiefly of protein, are formed at the periphery of the centropiasm when protein production exceeds carbohydrate assimilation. The whole centropiasm is regarded as the cell nucleus, a structure in which there is no division of work between karyoplasm and carbohydrate plastid, and which B. designates by the name karyoplast. H. G.

Plant physiology. VI. Chlorophyll in crystals. R. KOLEWITZ. *Aus der Natur*

16, 330-3(1920); *Physiol. Abstracts* 6, 223.—To obtain crystals of cryst. chlorophyll, leaves of *Galeopsis tetrahit* are extd. with 80 to 98% alc. for 24 hrs. in the dark. Some drops of the soln. so obtained are placed on a glass slip, and this in a petri dish; the liquid evaps. in 6 to 12 hrs. Under a magnification of 400 diams. the residue appears in the form of triangular plates (up to  $28\ \mu$ ) of a deep green color, together with the rhombic microcrystals of carotin and xanthophyll. The following plants rich in chlorophyllase may also be used: *Asparagus officinalis*, *Acorus*, *Dahlia*, *Heracleum*, *Stachys sylvaticus*.  
H. G.

**Trophic curves** of liver-wort rhizoids. H. LANGER. *Ber. bot. Ges.* 37, 262-7(1919); *Physiol. Abstracts* 6, 165.—The rhizoids of *Marchantia* and *Lunularia* show a positive geotropic reaction which, however, can be abolished by the negative phototropism in feeble light. The rhizoids of *Lunularia* are positively aerotropic, and show also a chemotropic reaction (positive or negative according to concn.) to  $\text{KNO}_3$  and glucose, and a positive reaction to asparagine and tyrosine, and a negative reaction to  $\text{CaHPO}_4$ .  
H. G.

**Fatty formations of Vaucheria.** G. MANGENOT. *Compt. rend. soc. biol.* 83, 982-3 (1920); *Physiol. Abstracts* 6, 228.—Two sorts of oil drops are found in *Vaucheria*: one kind, consisting of spheres of various sizes which arise in the chloroplasts, are the first visible product of assimilation; the second kind are found in the cytoplasm, are mobile and much smaller; they suggest microsomes.  
H. G.

**The "Kalk-kali Gesetz."** P. EHRENBERG. *Landwirtschaftliche Jahrb.* 57, 1-159 (1919); *Physiol. Abstracts* 6, 228.—The "Kalk-kali Gesetz" is proved by the following expts.: When plants which receive only small quantities of K get too much Ca, the plants cannot assimilate enough K. This fact has a very harmful influence on the plants. By increasing the K content of the fertilizer, the superfluous Ca can be thrown out, and the plant brought up to better or normal growth.  
H. G.

**Biology and physiology of protective materials of higher plants.** N. PASTCHOVSKY. *Naturw. Wochschr.* 19, 497-506(1920); *Physiol. Abstracts* 6, 158.—Critical review.  
H. G.

**Light physiology of plants.** F. J. MEYER. *Naturwissenschaften* 8, 842-51(1920); *Physiol. Abstracts* 6, 232.—A review.  
H. G.

**Physiology of cell division.** G. HABERLANDT. *Sitzb. preuss. Akad. Wiss.* 1920, 323-38; *Physiol. Abstracts* 6, 222.—The particular cell divisions in cells of *Coleus rehneltianus* and *Elodea densa* after plasmolysis in dil. solns. of glucose are not caused by mech. irritation, but by the increased concn. of cellular solutions, which effect a chem. irritation.  
H. G.

**Detection of oxalates in plant tissues.** W. PLÄHL. *Z. wiss. Mikros.* 37, 130-5(1920); *Physiol. Abstracts* 6, 223.—Oxalic, tartaric, citric, and malic acids or their salts give a ppt. of the Ag salt with  $\text{AgNO}_3$ , but if free  $\text{HNO}_3$  is present only oxalic acid gives a ppt. The presence of other substances may affect the reaction, hence, when used as a microchem. test, the cell should be freed of contents other than the crystals examd. P. proposes as a microchem. reagent a 20%  $\text{AgNO}_3$  soln. with 15%  $\text{HNO}_3$  (sp. gr. 1.065).  
H. G.

**Carbon metabolism of plants. Similarities between fungi and green plants.** TH. BOKORNY. *Centr. Bakt. Parasitenk., Abt. II* 47, 191, 301-75(1917).—Alcs., phenols, aldehydes, org. acids, carbohydrates, amides, and amines are studied in respect to their comparative ability to support life in fungi and higher plants. The results with a large number of compds. studied are tabulated.  
JULIAN H. LEWIS

**Efflorescence on *Rhodymenia palmata*; presence of a xylan in Florideae.** C. SAUVAGEAU and G. DRNIGÈS. *Compt. rend.* 174, 791-4(1922); cf. *C. A.* 16, 1450.—*R. palmata* collected at Roscoff at various seasons gave on drying an abundant efflor-

escence of KCl but neither mannitol nor trehalose. Samples from Iceland had less KCl and some mannitol. In a sample from the U. S. Schwartz isolated a substance which gave the Salkowski reaction for pentosans and which by distn. with HCl gave a furfural mixt. contg. 5 or 6% of methylfurfural, indicating the presence of methylpentosan. The  $C_5H_8O_4$ -Cd-Br compd. of the pentosan indicates according to G. Bertrand a xylose, and that the pentosan in *R. palmata* is a xylan. L. W. RIGGS

**Cytology of vegetable crystals.** E. C. JEFFREY. *Science* 55, 566-7 (1922).—It is generally stated that  $CaC_2O_4$  crystals are formed by the ordinary processes of crystn. in the fluid of the cell sap occupying the vacuolated center of the mature vegetable cell. This description "is in all respects profoundly inaccurate." Crystals were studied in plants of the ginkgo, walnut, cactus, begonia and geranium families. Sections through mature tissues or through growing points show the presence of druses in pith, cortex and phloem. When the  $CaC_2O_4$  is removed by solvents an org. matrix is seen as a residuum maintaining the form of the crystal after the Ca compd. has disappeared. Cells near the growing point are densely filled with protoplasm and those which are to produce crystals are easily recognized from the first. The crystals are laid down about the nucleus when the protoplasm of the element is still dense and unvacuolated. From the beginning the crystals occupy practically the whole lumen of the cell, and form a spiny casing which surrounds nucleus and protoplasm. In many cases the cell wall grows to accommodate the crystal. L. W. RIGGS

**Physiology of the "polyamyloses."** I. H. PRINGSHEIM AND K. O. MÜLLER. *Z. physiol. Chem.* 118, 236-40 (1922).—Di-, tri-, tetra-, and hexaamyloses are not available for starch formation in *Spirogyra dubia*. R. L. STEHLÉ

**Formation of urease in plants.** A. KIESEL AND TROITZKI. *Z. physiol. Chem.* 118, 247-53 (1922).—Drying and autolysis diminish the apparent urease content; with ripening it increases. The content in leaves is greater than in stems and roots. R. L. STEHLÉ

**Occurrence of ornithine in plants.** A. KIESEL. *Z. physiol. Chem.* 118, 254-66 (1922).—In order to ppt. ornithine with the least possible loss with phosphotungstic acid the ornithine soln. should be concd., the reagent in great excess and the reaction neutral. Time should be allowed for crystn. before filtering and phosphotungstic acid soln. should be used for washing (not  $H_2SO_4$ ). Previous failures to find ornithine in plants may be due to failure to appreciate the analytical requirements. R. L. STEHLÉ

**The enzymic decomposition of arginine in plants.** A. KIESEL. *Z. physiol. Chem.* 118, 267-76 (1922).—*Secale cornutum*, *Vicia sativa*, *Angelica silvestris*, and *Trifolium pratense* contain arginase and urease. In ergot no evidence was found which indicated the enzymic formation of agmatine or guanidine from arginine. R. L. STEHLÉ

The limits of sugar accumulation in beets (LOBE) 28.

## E—NUTRITION

PHILIP B. HAWK

### NORMAL

**Studies in the diet of the Korean people.** J. D. VAN BUSKIRK. *China Med. J.* 36, 126-45 (1922); cf. *C. A.* 16, 1452.—Thirty diet lists of students over a period of 1 month in winter and spring are reported. The total caloric value averages 2400 cal. for 70 kg. body wt., 80% of which is furnished by rice, supplemented by millet, barley, peas, and beans. The av. diet indicates 90 g. protein per day, of which 16 g. is animal protein. Fish is the most common animal food; milk and butter are not used. V. believes that the great bulk of the diet interferes seriously with digestion and absorption. Urine N is measured; feces N is estd., and the protein absorption is cald. at 75%. W. H. ADOLPH

**The relation of nutrition to tooth development and tooth preservation. I. A preliminary study of gross maxillary and dental defects in 220 rats on defective and deficient diets.** E. V. McCOLLUM, NINA SIMMONDS, ETHEL M. KINNEY AND CLARENCE J. GRIEVES. *Bull. Johns Hopkins Hosp.* 33, 202-15(1922).—The percentage of oral defects was greatest in those rats fed diets deficient in protein, Ca and fat-sol. A. The rats on diets low in Ca exhibited the next highest incidence and those on diets low in both Ca and fat-sol A had the third percentage of incidence. The diets low in Ca and high in fat-sol A, those contg. low or defective protein, together with low fat-sol. A, and those in which the only deficiency was fat-sol. A formed a middle group producing 11.1% oral defects. The oral tissues were least damaged by the diets high in Ca and low in fat-sol. A, those high in both Ca and cod-liver oil and those low in Ca and in cod-liver oil. No caries-like lesions, pulp exposure or osteodentin, attaching tissue or maxillary defects occurred in the stock rats. The 0.36% of defects in stock rats resulted from fracture or overgrowth.

I. GREENWALD

**Studies on the digestibility of proteins in vitro. III. The chemical nature of the nutritional deficiencies of arachin.** D. B. JONES AND H. C. WATERMAN. *J. Biol. Chem.* 52, 357-62(1922).—Arachin, raw or cooked, even at 15 lbs. pressure for 1 hr., or isolated without the use of EtOH or Et<sub>2</sub>O or of high temps., was less readily digested by pepsin and trypsin, *in vitro*, than other biologically available proteins. Under the same conditions, arachin was 48% digested as against 58% for cooked phaseolin and 61% for casein. By heating arachin with 20 vols. of 0.1 N NaOH at 80° for 1 hr. and then pptg. with acid, a prepn. was obtained which amounted to about 1/3 the wt. of arachin taken but which contained 2/3 the total histidine, 1/3 total arginine and 2/3 total lysine. Under the conditions used for testing arachin and the other proteins, only 24% was digested. The failure of arachin to act as a biologically complete protein may be due to the existence of difficultly broken linkages between essential amino acids.

I. GREENWALD

**The nutritional requirements of baby chicks. II. Further study of leg weakness in chickens.** E. B. HART, J. G. HALPIN AND H. STRENBLOCK, with the cooperation of O. N. JOHNSON AND A. BLACK. *J. Biol. Chem.* 52, 379-86(1922).—Baby chicks were reared to a weight of 800 g. or more (11 weeks) on a diet of white corn, skimmed milk, NaCl, CaCO<sub>3</sub> and cod-liver oil, with a litter of shavings. When the cod-liver oil was omitted, the animals died in from 4 to 6 weeks, developing "leg weakness" and showing a low inorganic P in the blood serum.

I. GREENWALD

**The role of cystine in the dietary properties of the proteins of the cowpea, *Vigna sinensis* and of the field pea, *Pisum sativum*.** A. J. FINKS, D. B. JONES AND C. O. JOHNS. *J. Biol. Chem.* 52, 403-10(1922).—The proteins of the cowpea, like those of the beans of the genus *Phaseolus*, are limited in their nutritive value by a deficiency of cystine and by an indigestibility which can be remedied by cooking. Only 1/3 to 2/3 of the normal rate of growth of albino rats was obtained on a diet in which 70% of cowpea meal, equiv. to 16.5% of protein, furnished the sole source of protein. Field-pea meal, fed at the same protein level, enabled rats to grow at a practically normal rate without the addition of cystine or cooking. The proteins of the field pea and those of the cooked cowpea plus cystine were equally efficient in promoting growth at a practically normal rate, while the proteins of the cowpea raw, plus cystine, or cooked, without cystine, were less than half as well utilized as those of the field pea.

I. GREENWALD

**The relation between the endogenous catabolism and the non-protein constituents of the tissues.** H. H. MITCHELL, W. B. NEVENS AND F. E. KENDALL. *J. Biol. Chem.* 52, 417-37(1922).—Rats were kept on a diet of 76% starch, 10% butter-fat, 8% sucrose, 3% salt mixt. (Osborne and Mendel, except for a few, in whose diet H<sub>2</sub>PO<sub>4</sub> replaced H<sub>2</sub>SO<sub>4</sub>) and 3% agar and which contained 0.82 mg. N per g. of food. After 1-22 days on this



diet, they were killed, the intestines washed out, the carcasses ground and analyzed for the distribution of N (and of S in the case of animals on the S-poor diet). The results were compared with those obtained with other rats killed after a day's fast following a diet of dog biscuit and milk. The N of the urine and feces of the rats on the exptl. diet was detd. and found to fall, within a day or two, to a low level and then to decrease only slowly with the weight of the rat. The bodies of the rats on the exptl. diets showed no marked change in total *non-protein N*, *non-protein S*, ratio of either of these to total N or S, respectively, or to each other, or in concn. of  $\text{NH}_4\text{-N}$ . There was a distinct fall in the concn. of *creatinine* and of *urea*. Attention is called to the similar constancy of the concn. of  $\text{NH}_4\text{-N}$  in the bodies of migrating salmon (Greene, C. A. 13, 3223), the existence of the auto-oxidizable dipeptide of glutamic acid and cysteine (Hopkins, C. A. 15, 3119), the occurrence of a peculiar amino acid,  $\beta$ -alanine (as carnosine) in muscle and the concn. of creatine therein; all of which are believed to indicate that the amino acids of tissues are not merely in the process of combination to form proteins nor degradation products thereof but are themselves directly functioning in tissue metabolism. If no food protein is supplied, the necessary amino acids are obtained from body protein. If sufficient food protein is supplied, this may supply the entire demand for amino acids and there may be practically no decompn. of tissue protein. In other words, what Folin regarded as endogenous protein metabolism is considered to be essentially a metabolism of amino acids which need never have been an integral part of the protein of that organism. Further evidence for this point of view is seen in the fact that  $\text{urea} + \text{NH}_3 - \text{N}$  constitutes 90% or more of the total N of the urine when much protein is being metabolized, whether this be derived from food or from the body, as in fever or fasting, as against 70% on a carbohydrate-rich, N-poor diet. The similar differences in the distribution of S and in the relation of total S to total N also indicate that endogenous N metabolism is not, essentially, a metabolism of protein. The variations in uric acid excretion with amt. of protein in the food (Lewis, Dunn and Doisy, C. A. 12, 2607) as compared with the constancy in the excretion of creatinine also support this view. *Creatine* is believed to be derived from *arginine* (Thompson, C. A. 12, 285). The data of Myers and Fine (C. A. 9, 2262) are analyzed to show that the difference between the av. for the creatine content of the muscles of rats on a diet of edestine (14% arginine) and that of those on a diet of casein (4% arginine), though slight, was still more than 7 times its probable error. The failure of Rose, Dimmitt and Bartlett (C. A. 12, 1657) to confirm the findings of Denis and Minot (C. A. 11, 3305) as to the relation between high-protein feeding and creatinuria in women may be due to the differences in the diets employed. Those of D. and M. contained 50 g. gelatin, rich in arginine; those of R., D. and B. contained no gelatin. I. GREENWALD

**Recent acquisitions in the domain of nutrition: the vitamins and avitaminoses.** EUGENE WOLLMAN. *Rev. hyg.* 44, 232-54(1922).—A review. JACK J. HINMAN, JR.

**The vocabulary of metabolism.** MAX KAHN. *Science* 55, 704(1922).—These new terms are suggested: *Eubolism*, a condition of normal bodily metabolism, *pathobolism*, a condition of perverted metabolism of a diseased nature, *e. g.*, diabetes; *dysbolism*, a condition of disturbed metabolism not necessarily of a diseased nature, *e. g.*, alkaptonuria. E. H.

**Diet and sex as factors in creatinuria of man.** G. STEARNS and H. B. LEWIS. *Am. J. Physiol.* 56, 60-71(1921).—There appears to be no direct relation between the phases of the menstrual cycle and the appearance of creatine in the urine of the adult woman. High-protein diets during the menstrual period have no greater tendency to produce creatinuria than during the intermenstrual period. Creatine given *per os* appears to be destroyed or converted as effectively by the female organism as by the male. J. F. LYMAN

**Nutrition. VI. The nutritive value of the proteins of the lima bean, *Phaseolus lunatus*.** A. J. FINKS AND C. O. JOHNS. *Am. J. Physiol.* 56, 205-7(1921); cf. *C. A.* 15, 2475.—When supplemented with 0.3% of cystine the proteins of the lima bean are adequate for normal growth in white rats. Without cystine addition, wt. was maintained, but there was no growth. **VII. The nutritive value of the proteins of the adzuki bean, *Phaseolus angularis*.** C. O. JOHNS AND A. J. FINKS. *Ibid* 208-12.—Raw or cooked adzuki bean meal, supplemented with cystine, furnished adequate protein and water-sol. vitamin B for normal growth. Without cystine addition, similar diets supported growth in albino rats at 33 to 66% of the normal rate. J. F. LYMAN

**Poultry fleshing investigations. The utilization of soy-bean and corn proteins as affected by suitable mineral supplement.** D. C. KENNARD, R. C. HOLDER AND P. S. WHITE. *Am. J. Physiol.* 59, 298-309(1922).—For fattening cockerels (12-14 day feeding period) a mixt. of corn meal and soy-bean meal (81 : 19) supplemented by 2% minerals ( $\text{CaCO}_3$  20%,  $\text{NaCl}$  20% and 60% bone ash) produced gains only slightly inferior to those produced by corn meal and buttermilk. Without mineral supplement, corn and soy-bean meal did not prove a satisfactory ration, the resulting gains being much smaller and consisting largely of fat. The increase of flesh produced by the corn meal-soy bean ration + minerals contained 61.4% more protein than that obtained by feeding corn meal and soy-bean meal without supplement. On the ration supplemented with minerals the retention of N was 27.38% larger than when the minerals were withheld. J. F. LYMAN

**Plant sources of vitamins B and C.** F. O. SANTOS. *Am. J. Physiol.* 59, 310-34 (1922).—The test for vitamin B employed was the recovery in wt. of rats which had been declining because of a lack of this accessory in the previous diet. Togi (sprouted mongo beans), okra and avocado were comparatively high in vitamin B, 0.5 g. daily added to the synthetic diet causing wt. recovery. Mongo beans, sweet potato leaves and duhat were required in 1-g. amts. daily. Artichokes (*Cynara scolymus*), bilimbi, banana-flower bud and bamboo shoots are relatively poor in vitamin B. Mongo beans are poor in vitamin C but fresh togi is relatively rich. Prepn. of togi for culinary use, however, destroys vitamin C. J. F. LYMAN

**Effect of vitamin deficiency on various species of animals. II. The comparative vitamin A requirement of rabbits, rats, swine and chickens.** V. E. NELSON, A. R. LAMB AND V. G. HELLER. *Am. J. Physiol.* 59, 335-45(1922).—Rabbits require a relatively larger allowance of vitamin A than the rat, pig and possibly the chicken. Certain rations that quickly caused scurvy in guinea pigs and which were complete except for the vitamin C produced optimum growth in the rabbit with no symptoms of scurvy. Rabbits fed oats supplemented by  $\text{NaCl}$  and  $\text{CaCO}_3$  became paralyzed in the hind quarters after 2 to 4 months feeding; the further addition of butter fat in most cases prevented the paralytic symptoms. J. F. LYMAN

**Influence of meat upon physical efficiency.** S. H. BASSETT, E. HOLY AND F. O. SANTOS. *Am. J. Physiol.* 60, 574-7(1922).—Expts. are reported with 4 subjects with 2 high-protein periods and 2 low-protein periods of 1 week each for each subject. The absence of meat from the human dietary for periods of 1 week had no demonstrable effect upon the capacity of doing an amt. of work so graded as to reach the limit of physical capacity during a short period of time. J. F. LYMAN

**Amino acids in nutrition. V. Nutritive value of edestin (globulin from hemp seed) : Cystine and lysine as growth-limiting factors in that protein.** B. SURE. *Am. J. Physiol.* 61, 1-13(1922); cf. *C. A.* 16, 1108.—Edestin as the sole protein in the diet of rats is inadequate for growth. Cystine and lysine at least are two amino acids responsible for the deficient quality of the edestin. J. F. LYMAN

**The biological analysis of milk.** H. SIMONNET. *Bull. soc. hyg.* 10, 125-78(1922).—

A general review of work published on the value of milk considered as a source of the accessory factors A, B, C. A bibliography of 5 pages is given. A. P.-C.

The influence of the relation of the basic and acid content in the diet upon the metabolism of food and energy in children. GERTRUD BAUMGARDT. *Arch. Kinderheilk.* 69, 209-38(1921).—The N metabolism and energy production of children are not definitely affected by wide variations of basic and acidic content of a mixed diet. Even on prolonged feeding (10 weeks) of mineral acids there is no loss of Ca from the body, the acid being entirely neutralized by  $\text{NH}_4$ . W. A. PERLZWEIG

The acid-base balance in animal nutrition. I. The effect of certain organic and mineral acids on growth, well being and reproduction of swine. A. R. LAMB AND J. M. EVVARD. Iowa Agr. Expt. Sta., *Res. Bull.* No. 70, 175-92(1921).—Four lots of pigs were fed equal amts. of a good basal ration. Three of the lots received  $\text{H}_2\text{SO}_4$ , lactic and acetic acid, resp., in amts. up to 500 cc. of N soln. per pig per day for 150 days. The acid-fed pigs did as well as the normal lot. There was no effect on growth. II. Metabolism studies on the effect of certain organic and mineral acids on swine. *Ibid* 183-92.—Metabolism studies on a growing pig were conducted to obtain information regarding the fate of ingested  $\text{H}_2\text{SO}_4$ , lactic and acetic acids in the animal body. On a ration contg. a liberal amt. of Ca the animal apparently oxidized the org. acids completely, with no increase in urinary ammonia; the acids seem to bring about a slightly increased retention of Ca. On the same basal ration plus 300 cc. N  $\text{H}_2\text{SO}_4$  per day, 61% of the acid ingested was neutralized by means of  $\text{NH}_3$  and 5% excreted as phosphates. On another basal ration very low in Ca, extra  $\text{NH}_3$  excretion accounted for 76% of the acid fed and extra urinary acidity for 10%. On neither ration did the mineral acid cause a significant loss of Ca nor did it interfere with the storage of protein.

J. J. SKINNER

Recent applications of the principles of nutrition. H. VIOLLE AND T. C. MERRILL. *Am. J. Public Health* 12, 568-74(1922).—A review of v. Pirquet's system. N. V. P.

#### ABNORMAL

Clinical calorimetry. XXX. Metabolism in erysipelas. WARREN COLEMAN, DAVID P. BARR AND EUGENE F. DU BOIS. *Arch. Intern. Med.* 29, 507-82(1922).—Eight observations were made on 5 patients with facial erysipelas during the febrile period and 2 on the day following the crisis. During the fever, the total metabolism was increased by from 19 to 42% above the normal, the increase being roughly proportional to the degree of fever and a temp. of  $40^\circ$  involving an increase in metabolism of about 40%. Whereas in normal subjects 24% of the heat loss is accomplished by evapn. of  $\text{H}_2\text{O}$ ; in these patients from 23.6 to 33.4% was thus eliminated. XXXI. Observations on the metabolism of arthritis. RUSSELL L. CREIL, DAVID P. BARR AND EUGENE F. DU BOIS. *Ibid* 583-607.—During afebrile periods, patients with acute, subacute or chronic arthritis and a patient with *gout* showed a basal metabolism within normal limits and with normal respiratory quotients. On low-protein diets, patients with arthritis deformans excreted only small amts. of N, indicating that there was no toxic destruction of body protein. XXXII. Temperature regulation after the intravenous injection of proteose and typhoid vaccine. DAVID P. BARR, RUSSELL L. CREIL AND EUGENE F. DU BOIS. *Ibid* 608-34.—Eight observations were made on 5 patients after the administration of proteose or of typhoid vaccine. Five of these were in the period of chills. During this period the metabolism was increased from 75 to 200% with almost no increase in heat loss. After the chill, both production and loss of heat are, for a time, from 20 to 40% above normal. As the temp. falls, the production of heat diminishes and the rate of elimination increases but the difference between the two is not so great as during the chill. The respiratory quotient is high during the chill, probably due to a

rapid combustion of glycogen. The av. body temp. was calcd. from the amt. of heat during the chill and was found roughly to parallel the rectal temp., though a slight fall in one could be coincident with a slight rise in the other. Approx. the normal fraction of the heat produced (22%) is lost by the evapn. of  $H_2O$ .

I. GREENWALD

**Occurrence of anemia in rats on deficient diets.** W. M. HAPP. *Bull. Johns Hopkins Hosp.* 33, 163-72(1922).—Diets poor in fat-sol. A or in  $H_2O$ -sol. B, though they produced severe nutritional disorders, did not produce anemia. If the deficiency in B was sufficiently great to induce polyneuritis, leucopenia was also observed. Rickets-producing diets, contg. a normal amt. of Ca but low in P, did not produce anemia but those poor in Ca and rich in P did, after a long time, induce anemia with, frequently, an enlargement of the spleen. Well balanced diets, poor in Fe, or diets of bread and milk, or of milk alone, did not induce anemia in the first generation but a slight anemia sometimes occurred in the second generation.

I. GREENWALD

**Studies on experimental rickets. XIX. The prevention of rickets in the rat by means of radiation with the mercury vapor quartz lamp.** G. F. POWERS, E. A. PARK, P. G. SHIPLEY, E. V. MCCOLLUM AND NINA SIMMONDS. *Bull. Johns Hopkins Hosp.* 33, 125-7(1922).—Ten rats were placed on a diet rich in Ca but poor in P and in fat-sol. A, which in control rats regularly gave rise to rickets, and were daily exposed to the light from a Hg vapor quartz lamp for varying periods of time. None of them developed rickets. XX. The effects of strontium administration on the histological structure of the growing bones. P. G. SHIPLEY, E. A. PARK, E. V. MCCOLLUM, NINA SIMMONDS AND ETHEL MAY KINNEY. *Ibid* 216-20.—Rats on a diet consisting of 20% cooked and dried liver, 10% casein, 1% KCl, 1% NaCl, 65% dextrin and 3% butterfat, with the addition of 1.5%  $CaCO_3$ , grow normally and do not show rickets but if 2.2%  $SrCO_3$  be added instead of the  $CaCO_3$ , growth is stimulated and rickets appears. The addition of cod-liver oil does not prevent this change. The lesions observed by Lehnerdt (*C. A.* 8, 733) in dogs were not due to the addition of Sr alone but to a diet poor in Ca, high in P and deficient in fat-sol. A or in the other fat-sol. vitamin found notably in cod-liver oil. XXI. An experimental demonstration of a vitamin which promotes calcium deposition. E. V. MCCOLLUM, NINA SIMMONDS, J. ERNESTINE BECKER AND P. G. SHIPLEY. *Ibid* 229.—The fat-sol. A of cod-liver oil was destroyed by passing air through the oil heated to 100° for 10-20 hrs. The oil no longer cured xerophthalmia but it was as effective in curing rickets as was the untreated oil.

I. GREENWALD

**The threshold of ketogenesis.** R. M. WILDER AND M. D. WINTER. *J. Biol. Chem.* 52, 393-401(1922).—By the methods employed by Shaffer (*C. A.* 15, 3307; 16, 741), Woodyatt (*C. A.* 16, 2167) and Wilder, Boothby and Becker (*C. A.* 16, 1798), it was found that a clinically significant ketosis did not appear in uncomplicated diabetes (14 cases) unless the ratio of ketogenic to antiketogenic substances was in excess of 2 : 1. Infections seem to lower the ketogenic threshold so that ketosis may appear with lower ratios. Since other conditions may have a similar effect, it is best to avoid the 2 : 1 ratio by a safe margin. Cf. following abstr.

I. GREENWALD

**A graphic method for the calculation of diabetic diets in the proper ketogenic-antiketogenic ratio.** R. R. HANNON AND WM. S. MCCANN. *Bull. Johns Hopkins Hosp.* 33, 128-9(1922).—A chart is published, by means of which it is possible, given the required total energy and protein intake, to calc. the necessary amt. of carbohydrate and the max. amt. of fat in a few seconds. A maximal ketogenic-antiketogenic ratio of 1 : 1 is assumed. Cf. Shaffer, *C. A.* 15, 3307; 16, 741; Woodyatt, *C. A.* 16, 2167, and Wilder and Winter, preceding abstr.

I. GREENWALD

**Standardization of the test meal.** V. KNAPP. *N. Y. Med. J.* 115, 695-8(1922).—A compilation and comparison of the test meals used in the study of gastric disorders

by various hospitals. The results of the inquiry show a lack of similitude in standardization and procedure. It is suggested that the Ewald meal, consisting of 35 g. of fresh roll and 300 cc. of tap water, be used. This is to be weighed accurately and measured and eaten on an empty aspirated stomach under inspection. One hr. after eating the meal it is to be entirely aspirated and subjected to analysis. F. S. HAMMETT

**Fat-free human milk as a curative food.** EDUARD FRIEDBERG AND C. NOEGGERATH. *Arch. Kinderheilk.* 68, 195-213(1921).—The beneficial effects of human milk defatted by means of centrifugalization upon infants suffering from intestinal decompn. and intoxication were exptly. established. The tolerance of such patients for greater quantities of milk fat under this treatment is said to increase progressively, except in cases of severe fat-susceptibility. The advisability of wider therapeutic application of defatted human milk is urged. W. A. PERLZWEIG

#### F—PHYSIOLOGY

ANDREW HUNTER

**Critical study of the condition of carbon dioxide in the blood.** T. R. PARSONS AND WINIFRED PARSONS. *Biochem. Z.* 126, 109-16(1921).—A critical discussion leading to the idea that the acid properties of blood are much more pronounced in the blood pigments than in the other blood proteins, that the  $\text{CO}_2$  dissoc. curve is explicable on this basis, that hemoglobin is a weak acid, as is  $\text{CO}_2$ , and that the alkali of the blood, either active or present in reserve, is distributed between the 2 according to their relative strength and concn. F. S. HAMMETT

**The chromogen of biliary red (rosso biliare) as a cause of pigmentation in urine of animals.** D. ZIBORDI. *Biochim. e terapia sper.* 8, 360-2(1921).—The generative substance of the red urinary pigment of Pittipaldi (*Riforma medica*, No. 32(1906); No. 51(1907)) has been found in the bile of cattle, sheep, swine, and dog.

H. W. BANKS, SRP

**The hydrogen-ion concentration of human feces.** C. S. ROBINSON. *J. Biol. Chem.* 52, 445-66(1922).—The reaction of the feces of normal individuals on a mixed diet was  $p_H = 7.0$  to  $7.5$ . The reaction of the first part of a movement was more alk. than the last part of the same or preceding movement by a  $p_H$  of 0.1 to 0.3. Phenolphthalein, aloes, castor oil and  $\text{MgO}$ , employed as laxatives, produced stools that were more acid than normal, the greatest change, to  $p_H = 5.9$ , being obtained with  $\text{MgO}$ . In this case, one of the immediately following stools had a  $p_H$  of 7.7. In the one subject studied, a pint of 0.8%  $\text{NaCl}$  acted as a laxative, but without change in the reaction of the feces. There was no marked change following the use of milk cultures of *B. bulgaricus* or of *B. acidophilus* or of large amts. of lactose, unless these produced diarrhea, in which case the reaction became more acid. I. GREENWALD

**Pigment metabolism and regeneration of hemoglobin in the body.** G. H. WHIFFLE. *Arch. Intern. Med.* 29, 711-31(1922).—W. postulates the existence of a "pigment complex" that may be formed from food or body protein, including hemoglobin and that may give rise to hemoglobin, bile pigments and, possibly, to urochrome and urobilin. The reformation of hemoglobin from bile pigments is denied as is also the absorption of stercobilin from the intestine. Blood regeneration after hemorrhage is accelerated by the following foods, which are effective in the order given: (a) red meat, cooked liver, hemoglobin and butter fat; (b) spinach and full diets of the common grains and milk. Celery, parsley, beet tops, sprouts, fish, clams, onions, beets, lard, cod-liver oil and the common preps., of Fe and As are inert. Pernicious anemia and hemochromatosis are believed to involve not an increased destruction of red cells but an increased formation of the "pigment complex" with, in the former condition, a deficient stroma-formation. I. GREENWALD

**The gastrin theory put to physiological test.** A. C. IVY AND J. E. WHITLOW. *Am. J. Physiol.* **60**, 578-88(1922).—Tests on a dog with pyloric and Pavlov pouches failed to demonstrate that food substances in contact with the mucosa of the pyloric antrum cause the formation of a hormone, gastrin, which is absorbed into the blood stream, carried to the glands of the fundic mucosa and stimulates them. The work of Edkins and Tweedy (*C. A.* **3**, 1182) was repeated; it is concluded that E. and T. did not properly control their experiments. J. F. LYMAN

**Simultaneous determinations of plasma and hemoglobin volumes. Influence of fluids by mouth and vigorous exercise.** F. W. LEE, E. B. CARRIER AND G. H. WHIPPLE. *Am. J. Physiol.* **61**, 149-57(1922).—Copious water ingestion in dogs will cause a distinct rise in total blood plasma vol. Sugar solns. by mouth do not influence blood plasma vol. Short periods of exercise (10 to 30 mins.) do not modify the blood plasma vol. to a convincing degree. Cf. *C. A.* **15**, 3297. J. F. LYMAN

**Influence of glands with internal secretions on the respiratory exchange. III. Effect of suprarenal insufficiency (by removal) in thyroidectomized rabbits.** D. MARLINE AND E. J. BAUMANN. *Am. J. Physiol.* **59**, 353-68(1922); cf. *C. A.* **15**, 3519.—Partial destruction of the function of the suprarenal cortex in rabbits with intact thyroids usually leads to an increased heat production. Removal of the thyroid prevents or greatly lessens this effect. While adrenaline in large amts. may stimulate the thyroid, it is believed that exhaustion or insufficiency of the regulatory inhibitory and restraining effect of the cortical influence is a much more important cause of increased thyroid activity and increased tissue oxidation in rabbits. J. F. LYMAN

**A blood anticoagulant obtained from body tissues, its chemical nature and its manner of action.** C. A. MILLS, G. MYNCHENBERG, G. M. GUEST AND S. DORST. *Am. J. Physiol.* **61**, 42-56(1922).—While normal lung tissue yields a globulin which is a very active blood coagulant, lung tissue which has been dried and extd. with benzene yields a globulin possessing a very strong anticoagulant power. This transformation of coagulant to anticoagulant involves the removal of the phospholipin from the coagulant globulin. When cephalin is added to the anticoagulant prepn. its coagulant power is restored. The expts. reported offer further support to the theory previously advanced by M. (*C. A.* **16**, 1613) of the mechanism of blood coagulation. J. F. L.

**The influence of adrenaline on metabolism in isolated skeletal muscle.** E. G. MARTIN AND R. B. ARMITSTEAD. *Am. J. Physiol.* **59**, 37-43(1922).—Prog sartorius muscle, immersed in solns. of adrenaline in Ringer fluid, showed definite augmentation of resting metabolism ranging from a 25% increase at dilns. of 1:425000 to 400% at 1:20000. J. F. LYMAN

**An explanation for the increase in oxidation brought about by muscular work.** W. E. BURGE AND J. M. LEICHSENRING. *Am. J. Physiol.* **59**, 290-3(1922).—Moderately severe muscular work increases the blood catalase of rabbits. The increase in oxidation brought about by muscular work is attributed to the increase in catalase. J. F. LYMAN

**The effects of adrenal feeding upon the iodine content of the thyroid gland.** E. M. BLACK, M. HUPPER AND J. ROGERS. *Am. J. Physiol.* **59**, 222-6(1922).—The addition of various prepn. of beef adrenal glands to the dietary of dogs caused an increase in the I content of the thyroid gland. An aq. ext. of beef adrenals fed to dogs for 45 days caused a gain of 70.4% in I content of the dog thyroid. Nucleoprotein material prepd. from beef adrenals produced a smaller increase, viz., 50.7%. An amt. of com. adrenaline, equiv. in epinephrine content to that used in the other tests, produced little if any gain. It seems that the adrenal ext. contains something other than adrenaline that has an effect on the thyroid. J. F. LYMAN

**The regeneration of blood.** Z. JENCKS. *Am. J. Physiol.* **59**, 240-53(1922).—

The regeneration of blood in white rats after unit hemorrhage while on a fixed diet was studied. Blood could be regenerated on diets deficient in one or more food factors. The rate of regeneration was most rapid on complete diets, vitamin-rich food excelling all others. Protein permitted more rapid regeneration than either carbohydrate or fat when fed as a sole nutrient. The effect of Fe on blood formation was not included in the study.

J. F. LYMAN

**Permeability of the placenta. I. Permeability to agglutinins, hemolysins, diphtheria antitoxin and diastase.** H. BOURQUIN. *Am. J. Physiol.* 59, 122-43(1922).—The permeability of the placenta of rabbits and guinea pigs to agglutinins, hemolysin to sheep corpuscles, diphtheria antitoxin, and diastase has been studied. Agglutinins and hemolysins tend to come to essentially the same concn. in the maternal and fetal blood. Diphtheria antitoxin passes rapidly from fetus to mother, slowly from mother to fetus. Normally the concn. of diastase in the fetal blood is lower than that of the maternal blood. An increase in the concn. of the maternal blood diastase is followed by a relatively slight increase in the diastase content of the fetal sera in some cases. It seems probable that the fetus has great power to destroy or remove from the blood diastase in excess of the amt. normal to the blood.

J. F. LYMAN

**Dextrose absorption in the renal tubules of the frog.** G. A. CLARK. *J. Physiol.* 56, 201-5(1922).—Perfusion expts. with frog kidneys led to the conclusions: (1) The glomerular membrane is completely permeable to dextrose soln., even when the latter is present in blood below the threshold value. (2) The epithelium of the renal tubules has the power to absorb dextrose from the glomerular filtrate up to the normal threshold value. This absorption is possible until the capillaries surrounding the tubules contain dextrose at a concn. of 9 to 10 times that normally present in blood. (3) In the absence of Ca the renal tubule is no longer capable of its normal activity. (4) No concn. of the glomerular filtrate by absorption of  $H_2O$  occurs in the frog.

J. F. LYMAN

**Determination of plasma and hemoglobin volumes after unit hemorrhages under controlled experimental conditions.** E. B. CARRIER, F. W. LEE AND G. H. WHIPPLE. *Am. J. Physiol.* 61, 138-48(1922).—Methods for detg. plasma vol. and hemoglobin vol. are those previously described (*C. A.* 15, 3297). Detns. of plasma vol. and hemoglobin vol. in dogs immediately after unit hemorrhage agree with the expected values. Immediately after unit hemorrhage and subsequent injection of glucose-acacia solns. the detd. plasma and hemoglobin vols. also agree with the expected values. Detns. made 18 to 24 hrs. after a unit hemorrhage show the expected values in hemoglobin or red cell values but a considerable increase in plasma vol. The normal dog after hemorrhage increases its plasma vol. to make up almost completely for the loss of red cells. This plasma vol. decreases to the normal level as the red cells are regenerated to normal.

J. F. L.

**Effects on the circulation of changes in the carbon dioxide content of the blood.** H. H. DALE AND C. L. EVANS. *J. Physiol.* 56, 125-45(1922).—Anesthetized or decerebrated cats show a rapid fall in blood pressure when rapid artificial respiration is applied, with atm. air or mixts. of  $O_2$  and  $N_2$ . When expired air is used in the artificial respiration there is no such fall in blood pressure. The effects noted seem to be due to an abstraction of free  $CO_2$  and not to changes in  $p_H$  of the blood; they are due to depression of the vasomotor centers of the bulb and spinal cord. The fall of blood pressure noted is the result of low  $CO_2$  in the blood and not of alkalosis as has been suggested.

J. F. LYMAN

**Renal blood flow and glomerular filtration.** E. B. MAYRS AND J. M. WATT. *J. Physiol.* 56, 120-4(1922).—The rate of blood flow through the kidneys, the amt. of  $SO_4$  in the blood, the amt. of urine excreted and the amt. of  $SO_4$  in the urine were detd. after intravenous injections of  $Na_2SO_4$ -gum arabic solns. into rabbits. It is calcd. that the proportion of blood plasma that comes into efficient contact with

the excretory cells varies between 6 and 40% of the whole plasma circulating through the kidney. In addition to the known phys. factors, the permeability of the glomerular capsule also may vary under physiol. conditions. J. F. L.

**The localization of excretion in the uriniferous tubule.** J. M. O'CONNOR AND E. J. CONWAY. *J. Physiol.* 56, 190-200(1922).—By means of a cannula in the ureter of a rabbit it is possible to obtain urine secreted in different parts of the kidney subsequent to the injection of substances on the theory that a substance excreted by the convoluted tubule would join the urine lower down in its course than if excreted through the glomerulus. Intravenous injections of various substances were timed and the urine subsequently excreted was collected in small portions for analysis. NaCl seems to be excreted at times by the tubule, at others by the glomerulus alone. Uric acid seems to be excreted by the second convoluted tubule and NaI seems to be excreted by the glomerulus. J. F. LYMAN

**Reflex produced by chemical stimulation of the deeper respiratory passages.** E. H. CRAIGIE. *Am. J. Physiol.* 59, 346-52(1922).—Stimulation of the deeper respiratory passages with irritant gases ( $\text{NH}_3$  and  $\text{Et}_2\text{O}$ ) produces a respiratory reflex consisting of an increased expiratory effort and inhibition of inspiration. The vasomotor response consists of a rather gradual fall in blood pressure followed at once by a somewhat slower return to normal. Both the respiratory and circulatory reflexes are entirely unaffected by section of both vagi. J. F. LYMAN

**The hydrolysis of sucrose in the human stomach.** R. M. HILL AND H. B. LEWIS. *Am. J. Physiol.* 59, 413-20(1922).—Under normal conditions in man any hydrolysis of sucrose that occurs in the stomach is very slight and due entirely to the action of HCl. No sucrose could be detected in the gastric contents, even after there had been regurgitation from the intestine. J. F. LYMAN

**Activation of the glandular stomach of the fowl.** J. B. COLLIP. *Am. J. Physiol.* 59, 435-8(1922).—Gastric juice can be obtained from fowls by holding the animal on its back, introducing a lumbar puncture needle into the lumen of the ventriculus or gizzard and aspirating the contents by means of a syringe. The proventricular glands, as judged by the acidity and vol. of the secretion, are definitely stimulated by intramuscular injection of exts. of the proventriculus and duodenum of the fowl, mammalian gastric mucosa and thyroid gland. The act of swallowing due to forced water drinking, in heus with esophageal fistula, caused a reflex stimulation of the glands of the proventriculus. J. F. LYMAN

**Fatigue in frog muscle when immersed in various concentrations of lipid solvents; especially the higher alcohols.** F. M. BALDWIN. *Am. J. Physiol.* 56, 127-39(1921).—MeOH, EtOH, PrOH, BuOH, AmOH, heptyl, and octyl alcs. were used. Muscles, when undergoing the process of fatigue, are qual. susceptible to differences in concn. of the medium with which they are surrounded. This implies that an intimate relation exists between the phys. state of the muscular envelope (plasma membrane) and the changing physiol. conditions within. J. F. LYMAN

**Energy expenditure in sewing.** C. F. LANGWORTHY AND H. G. BAROTT. *Am. J. Physiol.* 59, 376-80(1922).—The energy expended by a woman sewing by hand on various materials ranged from 4.3 cal. to 5.8 cal. per hr. for the actual work of sewing. With a foot power machine the expenditure of energy per hr. was about 6 times as great but per meter of sewing it was only one half as great. With an elec. driven machine the energy used per hr. was about twice as great as when sewing by hand and the energy per meter of sewing about one-fifth. J. F. LYMAN

**Blood fibrin studies. I. An accurate method for the quantitative analysis of blood fibrin in small amounts of blood.** D. P. FOSTER AND G. H. WHIPPLE. *Am. J. Physiol.* 58, 365-78(1922).—The advantages of the method are: (1) a small sample



(2 cc. plasma) is sufficient, (2) accuracy, (3) easy manipulation. Approx. 9 cc. of blood are collected from the vein by needle into a vaselined syringe and delivered immediately into a 15 cc. hematocrit tube which contains 1 cc. of a 1% Na oxalate soln. The contents of the tube are mixed by inverting twice. The mixt. is centrifuged for 30 mins. at 3000 r.p.m. The amt. of cellular elements and plasma are read to 0.1 cc. Exactly 2 cc. of the plasma are delivered by a calibrated pipet into a tumbler containing 40 cc. of 0.8% NaCl soln. and 2 cc. of 2.5%  $\text{CaCl}_2$  soln., thoroughly mixed and allowed to stand at room temp. for 2 hrs. To some abnormal specimens it is necessary to add normal serum and a longer period may be required for complete coagulation. The fibrin is freed from fluid elements by gentle manipulation and pressure with a glass rod. The fibrin mass is then washed in  $\text{H}_2\text{O}$ , placed in a small porcelain crucible and dried at  $110^\circ$  to const. wt. It is then ignited and reweighed. The difference in wts. before and after igniting is the wt. of fibrin. From the hematocrit reading the amt. of fibrin in 100 cc. of whole blood may be calcd. II. **Normal fibrin values and the influence of diet.** *Ibid* 379-92.—Individual dogs under uniform conditions have a relatively const. fibrin level, fluctuations in which should not exceed 20 to 25%. Under varying conditions blood fibrin may vary greatly. Diets high in animal protein (meat, liver, etc.) favor a high blood fibrin level as contrasted with fasting, fat or carbohydrate feeding. III. **Fibrin values influenced by transfusion, hemorrhage, plasma depletion and blood pressure changes.** *Ibid* 393-406.—Fibrinogen, unlike the serum proteins, is a very labile compd. in the blood. When variations in fibrinogen content of the blood are induced by various ways (*e. g.*, transfusion, hemorrhage, saline or acacia injection), there is a subsequent rapid return, usually complete in 24 hrs. to normal fibrinogen content. There seems to be a const. manuf. and use of fibrinogen in the body. Blood pressure changes do not by themselves modify the amt. of fibrinogen in the plasma. IV. **Fibrin values influenced by cell injury, inflammation, intoxication, liver injury, and the Eck fistula.** *Ibid* 407-31.—Tissue injury, produced by injection of turpentine (aseptic abscess), injection of toxic proteose, or by exposure to X-rays, caused an increase in blood fibrinogen. Extensive liver injury caused a fall in blood fibrin. The expts. indicate that the liver is the only potential source of fibrinogen in the body. Tissue injury is the most important single stimulus to over-production of fibrinogen and far exceeds the stimulus of a low blood fibrin level. J. F. LYMAN

**The cell-division hormone and its relations to wound healing, fertilization, parthenogenesis and to adventitious embryonic phenomena.** G. HABERLANDT. *Biol. Zentr.* 42, 145-71 (1922).—A review of H.'s work published in the *Sitzb. preuss. Akad. Wiss.* 1913-22 (cf. *C. A.* 15, 2914; 16, 2711). W. A. PERLZWEIG

**Contribution to the physiology and pathology of gastric digestion in the infant.** HEINRICH DAVIDSOHN. *Arch. Kinderheilk.* 69, 238-54 (1921).—The factors influencing the  $\text{H}^+$  concn. of the gastric contents of infants are: the HCl content of the gastric juice; the relative power of the milk to combine with HCl; the secretory stimulus exercised by the milk or feeding mixts.; the age of the infant (only if breast-fed); the constitution of the child (example, exudative diathesis); motility of stomach; nutritional state of child; the reaction of the milk. The method of removing two unequal portions of gastric contents for the detn. of acidity is found unsuitable. The difference in reaction between the contents taken near the periphery and those from the center of the stomach is not significant. The  $p_{\text{H}}$  of gastric contents with various artificial diets was found to be (av.):  $\frac{1}{3}$  cream milk, 5.1;  $\frac{2}{3}$  milk, 5.0; full milk, 5.6; protein milk, 4.7; buttermilk, 4.3. The duration of the digestion period before the removal of the contents does not influence appreciably the  $\text{H}^+$  value. The  $\text{H}^+$  concn. of the gastric contents does not increase with age in artificially fed infants. In breast-fed infants the  $\text{H}^+$  concn. of the gastric contents remains low during the first 6 months, from the 7th month it increases steadily

until it reaches a value indicating a fair degree of peptic digestion. The function of HCl secretion is incompletely developed during the first periods of infancy and develops with age. The delay in the progressive increase of  $H^+$  concn. of the gastric contents of artificially fed children is ascribed to the greater capacity of cow milk to combine with acid and to its lesser stimulatory effect upon secretion in comparison with human milk. A high  $H^+$  concn. of gastric contents was found in infants with exudative diathesis, while in influenzal and other infections subnormal values were found, depending upon the severity of the infection.

W. A. PERLZWEIG

**Rennin action of the duodenal juice.** M. LEIST. *Wiener klin. Wochschr.* 34, 400-1 (1921).—Trypsin and rennin action of the duodenal juice do not run entirely parallel. The rennin action remaining after the destruction or considerable weakening of the trypsin can be ascribed to erepsin. It is still a question which erepsin plays the greater role, that of the pancreas or that of the duodenal secretion, or whether both participate equally in the rennin reaction.

W. A. PERLZWEIG

**Investigations of blood sugar in infancy and in childhood.** ALBRECHT MERTZ. *Arch. Kinderheilk.* 68, 254-65 (1921).—A review of the recent methods and results of investigations. Bibliography.

W. A. PERLZWEIG

**Creatine and creatinine excretion of infants.** ER. SCHIEF AND A. BALINT. *Arch. Kinderheilk.* 69, 437-50 (1921).—The creatinine coeff. (mg. total creatinine excreted in 24 hrs. per kg. body wt.) is believed by the authors to be a reliable index of the relative amt. of muscle tissue in the child. Figures are given showing relatively high figures for well developed muscular infants and correspondingly low figures for "pasty" and undernourished infants.

W. A. PERLZWEIG

**Investigations of the blood sugar of children.** ALBRECHT MERTZ AND ERICH ROMINGER. *Arch. Kinderheilk.* 69, 81-106 (1921).—Employing the Bang-Hatlehoel (*C. A.* 12, 2333) method the authors found the av. fasting value of 0.081% for the blood sugar of normal infants, without any appreciable differences being observed for variations in ages and in the nutritional state. The absorption of glucose and the blood-sugar curve, after the administration of glucose, were found to be greatly affected by the state of swelling (hydration) of the mucous lining of the intestinal canal. This fact was demonstrated by preceding the dose of sugar with a small amt., 0.5 g., of tannin, which resulted in a slower and smaller rise of the blood-sugar curve. Normal infants showed wide variations in the blood sugar curve after ingesting 30 g. dextrose. Infants with exudative diathesis and acute dyspepsia gave higher curves. Dystrophic infants gave a normal or lowered blood sugar curve. In febrile children the fasting blood sugar was high, but it was within normal limits after ingestion of glucose. In liver disorder glucose or levulose ingestion caused severe hyperglucemia. In presence of renal disease with liver disorders an unusually high hyperglucemia was encountered.

W. A. PERLZWEIG

**Relation between the outflow of bile and pancreatic secretion.** M. FRHR. V. FALKENHAUSEN. *Arch. exptl. Path. Pharm.* 92, 173-82 (1922).—Cases of icterus, due to a variety of causes, were studied particularly with reference to the amt. of trypsin in the duodenal fluid. In the 35 cases reported the number of units of trypsin present varied from 125 to 500, the greater part of the cases showing a titration hardly up to the lower values in normal individuals. The introduction of 20 cc. of ox bile failed to produce any considerable increase in the trypsin titer (controlled by pilocarpine injections).

G. H. SMITH

**Tissue respiration and the vasomotor reaction.** H. GESSLER. *Arch. exptl. Path. Pharm.* 92, 273-9 (1922).—The O utilization of portions of human and swine skin was detd. at diff. temps. The increase between 33.7° and 40.3° amounted to about 80%; between 40.2° and 48.2° there is a further increase of about 100%. With further warm-

ing (to 52°) the metabolic rate is depressed and such a disturbance in function is not reversible. Various acids were added to the Ringer soln. in which surviving tissue was placed for detg. O utilization. The effect of the acids corresponded to the H-ion concn., acetic, propionic, and butyric acids acting in about the same way. Comparison of the effect of acids in producing hyperemia in living tissue and in causing change in O utilization of surviving tissue showed a definite parallelism. G. H. SMITH

**Influence of the thyroid on metabolism with particular reference to heat regulation.** PAUL SCHENK. *Arch. expl. Path. Pharm.* 92, 1-21(1922).—The hormone of the thyroid is of significance not only in connection with the degree of CO<sub>2</sub> elimination and O<sub>2</sub> absorption but it plays a very important role in regulating the quality of the combustion processes. In normal rabbits deprived of food the respiratory quotient ranges between 0.68 and 0.75, whereas in thyroidectomized animals deprived of food the quotient may be 0.44 to 0.48. The administration of thyreoglandol subcutaneously or intravenously changed the respiratory quotient in normal starving animals but slightly (0.74 to 0.76) while in those deprived of thyroid tissue the quotient went from 0.69 to 0.74. The hormone which regulates this action is protein-free and contains but little I (0.0013%). Heat regulation through chem. processes does not appear to be due to a direct stimulus of the heat centers but is rather indirect, through the intervention of glandular hormones, particularly that of the thyroid, since the restoration of normal bodily temp. after cooling is greatly delayed in the thyroidectomized animal. The serum of a cooled thyroidectomized animal has no effect upon the metabolism when it is transferred to another thyroidectomized animal; it is almost inert when introduced into a normal animal; but the serum of a cooled animal markedly increases the metabolism of a cooled thyroidectomized animal. Doubtless the hormones of the other endocrine glands play a role in heat regulation. G. H. SMITH

#### G—PATHOLOGY

H. GIDRON WELLS

**Bacillus welchii hemotoxin and its neutralization with antitoxin.** H. HENRY. *J. Path. Bact.* 25, 1-18(1922).—*B. welchii* produces in cultures a hemotoxin which can be measured *in vitro*. The same substance is present in ppts. from filtrates obtained by treatment with (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> or etc. The hemotoxin remains stable for a long time if stored in the cold. At 60° the bulk of the hemotoxin becomes inactive in 5 min. and the rest is very slowly altered at this temp. The results at 80° and 100° were similar in that the greatest action occurs in the first 5 min., the remaining hemotoxin being much more stable. A measurable amt. remains after 15 min. boiling. Union of hemotoxin with antitoxin is most rapid at 38°. The slight lag that occurs in the case of pptd. specimens of hemotoxins is attributable to the mass of hemotoxoid which they contain. The union appears to follow the law of multiple proportions. J. T. M.

**Examinations of the duodenal juice and blood serum in jaundice.** RUDOLF STRISOWER. *Wiener Arch. inn. Med.* 3, 153-226(1921).—Qual. and quant. chem. analysis showed that the duodenal juice from a fasting patient agrees fairly well with that of bile from a biliary fistula. The normal sp. gr. of the secretion of the liver is about 1.010, and higher values indicate albuminocholia. The normal value of NaCl is 0.6%, and the bilirubin content varies from 1 in 4000 to 1 in 6000. From a comparison of the bilirubin values in the blood serum and duodenal juice in 95 cases, including 80 cases of icterus, 3 forms of icterus can be distinguished. Mechanical icterus has a high bilirubin value in the serum, and low in the duodenal juice. Icterus following increased production of bile pigments with normal or disturbed excretion by the liver gives a high bilirubin content in the serum and the duodenal juice. Icterus resulting from a disturbance of the excretory power of the liver gives a normal value of bile pigment in the duodenal

juice and increased content in the serum. The qual. test for albumin in the duodenal juice is of diagnostic and prognostic importance and is positive in cholangitis, icterus lueticus, many forms of anemia, and cirrhosis of the liver. Hyperbilirubinemia was found in a number of tumor cases and hypobilirubinemia as well as low bile pigment content in the duodenal juice was observed in tuberculosis. HARRIET F. HOLMES

Preservation of agglutinating and hemolyzing sera. LUDWIG BITTER. *Centr. Bakt. Parasitenk., Abt. I* 88, 560-2(1922).—Immune sera are preserved by mixing with equal parts of glycerol (F. Ruediger, *C. A.* 10, 2596, 3080). JULIAN H. LEWIS

The use of dry heat in the preparation of vaccines (typhoid, dysentery and cholera). S. CHIBA. *Centr. Bakt. Parasitenk., Abt. I* 88, 79-93(1922).—Heating of bacterial antigens 24 hrs. in a drying chamber at 55° is superior to heating at 80° for 1/2 hr. The typhoid antigens prepd. in by the different methods do not differ in their antigenic properties, but in view of its lower toxicity the dry prepn. is to be preferred. The dry and moist cholera vaccines show no difference in any of their properties with dysentery vaccines. The dry prepn. produces a higher immunity in the rabbit. JULIAN H. LEWIS

Blood proteins in tuberculosis. A. FRISCH. *Beitr. klin. Tuberculose* 48, 145-69 (1921).—In pulmonary tuberculosis there is an increased serum protein content especially in advanced phthisis in distinction to the more sclerotic forms, while markedly cachectic cases reveal subnormal values; a strict conformity to this does not, however, exist. Detns. of the fibrinogen content of the blood plasma by the Winternitz refractometric method (*Arch. Derm. u. Syph.* 1910, 101; cf. *C. A.* 3, 2590) is of prognostic and diagnostic value. Ninety-six cases of pulmonary and pleural tuberculosis, classified according to the W. Newmann modified pathogenetic grouping of Bard-Picry and the Baemeister grouping, showed that a markedly increased fibrinogen content exists in the nodose and pneumonic forms of pulmonary, the serous effusion and intestinal, and the fibrotic and bronchial gland cases, while a barely appreciably increased or normal finding was characteristic of the latent and dry pleurisy cases. Repeated exams. of the fibrinogen content showed characteristic variations going hand in hand with the clinical course. There was a parallelism between the presence of fever and the fibrinogen content. It is believed that the fibrinogen originates from the pathologic processes which destroy the cell in the diseased areas and, therefore, can be taken as a measure of tissue destruction. Practically this test should differentiate active from inactive (latent) tuberculosis. H. J. CORPER

Immunity and radiant energy. CARL TIMM. *Beitr. klin. Tuberculose* 48, 195-208(1921).—Twelve studies with light, radium and Röntgen raying of the skin and subsequent testing of the specific and non-specific (fats of harmless air bacteria and sarcina) immunities indicate that there is an increase of the non-specific immune powers by the Röntgen ray; an increase to the A partigens of tuberculosis immunity by radium rays, and to F and N partigens by the light rays. The light rays also increase, but to a lesser degree, the immunity to A partigens and the non-specific immunity. The L immunity is not influenced by any of these. H. J. CORPER

Immunity studies in tuberculosis. A. FRISCH. *Beitr. klin. Tuberculose* 48, 224-35(1921).—As a result of studies with anticutin (Pickert and Lowenstein, *Deut. med. Wochschr.* 1908, No. 52; 1909, Nos. 23 and 35 (cf. *C. A.* 3, 661) and *Z. Tuberk.* 1910, 15) present in the serum of cases of tuberculosis treated with large doses of tuberculin and having the ability to unite with A. T. K. (old tuberculin) and preventing or diminishing the A. T. K. intracutaneous reaction, it is believed that a neutralization of the serum reaction by the A. T. K. should be considered. By the use of this neutralization phenomenon it is not possible to differentiate active from inactive tuberculosis. The designation "paradoxical reaction" (Kirch and Czizeti, *Beitr. klin. Tuberk.* 1920, 45) in which the serum and tuberculin mixt. give an increased reaction is rejected.

since of 6 cases of "paradoxical reaction" 4 gave a reaction with serum and the increased reaction was merely a summation of serum and tuberculin reactions. That specific antibodies are being dealt with in anticutin seems to be emphasized by inoculations of serums and tuberculous exudates. No analogy between anticutins and the immune analytic picture according to Deycke-Much could be obtained. No agreement between the clinical picture and the immunity analysis existed, even though it was realized that the "mathematical immunity analysis" is a picture of the partial reactivity of the skin and not an immunity status of the sick person toward the tuberculosis infection. In a number of cases coincident partigen studies and anticutin tests were performed. Intracutaneous reaction with the three individual partigens as also with the partigen combination was diminished by serum.

H. J. CORPER

**Lung stones.** A. SCHERER. *Beitr. klin. Tuberculose* 49, 17-27(1921).—Lung stones are rarely observed clinically. The chief constituents are carbonates and phosphates of Ca; silicates are found only in traces and  $MgCO_3$  and  $Mg_3(PO_4)_2$ , fats and cholesterol also are present. In no case were tubercle bacilli or a real tissue structure of any kind found in the stones.

H. J. CORPER

**Diabetes insipidus.** FRITZ BRUNN. *Z. ges. exper. Med.* 25, 176-87(1921).—In 2 cases of true diabetes insipidus neither hydremia nor NaCl content of the serum had any marked influence upon diuresis. In these cases the function of the kidneys is even more dependent upon the compn. of the blood than in normal individuals. E. B. F.

**Anemia produced by bacterial products.** C. BUSSON AND M. KOSIAN. *Z. ges. exper. Med.* 25, 199-210(1921).—Bacteria normally contained in the intestinal tract, after autolysis by means of pptn. with  $Et_2O$  and the extn. of a  $H_2O$ -sol. thermostabile toxin, are able to produce an "anemic state" but never a "primary pernicious anemia" in animals, following parenteral injection. The question whether such artificially produced toxins play a role in the pathogenesis of blood diseases in man is left open.

E. B. FINK

**A unique case of disturbed carbohydrate metabolism and its relation to diabetes mellitus.** RICHARD WAGNER AND J. K. PARNAS. *Z. ges. exper. Med.* 25, 361-84(1921).—The case reported is that of a female child 10 yrs. old with the following findings: In the morning in a fasting condition, the urine contained much acetone but no sugar. Glucosuria appeared after injection of amylase and sucrose. About 14 hrs. after the last meal the blood was practically sugar-free. After meals extreme hyperglucemia occurred and the urine contained much sugar. This disturbance in carbohydrate metabolism is probably due to anatomical changes in the liver resulting in a disturbed internal secretion while the external secretion remains intact. The first point to det. was whether a disturbance in adrenal function was responsible for glycogen mobilization and a resultant lability in blood sugar. The injection of adrenaline in doses which in normal children produced hyperglucemia had no influence on the patient under consideration. This seemed to indicate that there was no disturbance in glycogen mobilization but a lack of glycogen utilizable for mobilization.

E. B. FINK

**Production of antibodies by means of transplants.** K. OSHIKAWA. *Z. Immunität.* 33, 297-305(1921).—Following transplantation of skin of immunized rabbits to normal rabbits, the latter can be shown to produce antibodies. If rabbits are actively immunized by subcutaneous injection and the skin in the region of injection transplanted to a normal rabbit, the recipient will produce antibodies. The more easily the transplant heals, the greater the antibody production.

E. B. FINK

**The relation of antigen to antibody formation. (The influence of the antigen depots upon antibody formation.)** K. OSHIKAWA. *Z. Immunität.* 33, 306-16(1921).—The formation of agglutinins is undisturbed by removal of the skin area 10 min. after sub- or intracutaneous injections of killed bacteria (*B. proteus* X 19 Weil Felix). As

a matter of fact antibody formation is even more rapid after removal of the antigen depot. On the basis of these observations the theory of antibody formation is discussed.

E. B. FINK

**Study of some cases of diabetes insipidus with special reference to the detection of changes in the blood when water is taken or withheld.** C. D. CHRISTIE AND G. N. STEWART. *Arch. Intern. Med.* 29, 555-66(1922).—In 3 cases of diabetes insipidus, there were no definite changes in corpuscular vol. or in the elec. cond. of the serum following a period of 24 hrs. or more of deprivation of  $H_2O$  or 0.5 or 5 or 6 hrs. after the resumption of  $H_2O$ -drinking. There was no evidence of impaired kidney function and a urine of normal sp. gr. was obtained after administration of pituitary ext.

I. GREENWALD

**The alkali reserve in pulmonary tuberculosis.** D. S. HACHEN. *Arch. Intern. Med.* 29, 705-10(1922).—The  $CO_2$ -combining power of the blood plasma in severe tuberculosis is diminished slightly as the disease progresses and shortly before death reaches a min. of about 50 vols.

I. GREENWALD

**Blood pigment metabolism and its relation to liver function.** CHESTER M. JONES. *Arch. Intern. Med.* 29, 643-68(1922).—The urobilin content of the duodenal contents (d.c.) before and after the introduction of  $MgSO_4$  was detd. by the  $Zn(OAc)_2$  method of Wilbur and Addis (*C. A.* 8, 1986) and the bilirubin content of the blood plasma by that of Blankenhorn (*C. A.* 11, 1853). The introduction of  $MgSO_4$  was followed by an increased concn. of pigment in the d.c. In a case of *polycythemia vera* the concn. of pigment in the d.c. was normal. In all conditions involving marked blood destruction there was an increase in the pigment concn. in the d.c. which was generally absolute but sometimes only relative to the number of red cells per unit vol. of blood. This "relative" value was a good index to the general condition of the patient. In *pernicious anemia*, this increase was much greater than that following a severe *hemoglobinemia (paroxysmal)* so that an impairment of the hypothetical resynthesis of bile pigment into hemoglobin is assumed to exist in pernicious anemia. In simple anemia due to loss of blood, the pigment concn. of d.c. was below the normal while the "relative" value was normal except in one case of profound anemia, in which it was high and in which it is believed that the anemia had induced a deficiency in the resynthesis of hemoglobin. Increased pigment concn. was observed in cases of carcinoma of the liver and of cirrhosis due to alcoholism, syphilis and other causes. In these, there was no evidence of increased blood destruction and the increase in pigment concn. is ascribed to impairment of resynthesis. The concn. of pigment was greater in cases of uncomplicated cholecystitis than in those of cholelithiasis.

I. GREENWALD

**A study of hemoglobin metabolism in paroxysmal hemoglobinuria, with observations on the extrahepatic formation of bile pigments in man.** C. M. JONES AND B. B. JONES. *Arch. Intern. Med.* 29, 669-83(1922); cf. preceding abstr.—Intravascular hemolysis, insufficient to produce hemoglobinuria, was induced in patients with paroxysmal hemoglobinuria by immersion of an arm in cold  $H_2O$ . The hemoglobin began to disappear from the plasma within a few min. and, coincidentally, the concn. of bilirubin therein began to increase. As this grew greater, the concn. of bilirubin (method of Hooper and Whipple, *C. A.* 10, 1757) in the duodenal contents increased; then this diminished and the concn. of urobilin increased. This occurred so soon (1 hr.) after the increase in the bilirubin concn. of the duodenal contents as to make it unlikely that the urobilin had been formed in the intestine, then absorbed and reexcreted. In an expt., in which a tourniquet exerting a pressure greater than the systolic pressure was kept on the arm during the exposure to cold and subsequently, specimens of blood taken distal to the tourniquet showed a formation of bilirubin just as occurred when the blood was allowed to circulate freely. It is suggested that the greater part of such change ordinarily takes

place in the liver simply because of the great vascularity of this organ. After the hemoglobin had apparently disappeared from the plasma of the blood below the tourniquet, this was removed and 20 min. later the plasma of the blood in the general circulation contained hemoglobin. Since, before the removal of the tourniquet, there had been no hemoglobin in the plasma of the blood central to the tourniquet, this seems to indicate that the exposure to cold is responsible for the formation of a hemolysin which may not exert its full activity at this low temp. but requires the higher temp. of the rest of the body to develop its full activity.

I. GREENWALD

**A study in experimental diabetes. The effect of intravenous injection of pancreatic perfusates on the D/N ratio following pancreatectomy.** H. E. LANDHS, L. E. GARRISON AND J. J. MOORHEAD. *Arch. Intern. Med.* 29, 853-66(1922).—In pancreatectomized dogs, the ratio of glucose to nitrogen in the urine was not const., even in the same dog, and was generally between 1.0 and 1.5 and was only rarely over 2.0. This ratio was not appreciably altered by intravenous injection of the liquid obtained by perfusing dog pancreas with glucose-free Tyrode's soln. or with defibrinated blood from pancreatectomized dogs.

I. GREENWALD

**Immunological reactions of Bence-Jones proteins. II. Differences between Bence-Jones proteins from various sources.** S. BAYNE-JONES AND D. W. WILSON. *Bull. Johns Hopkins Hosp.* 33, 119-25(1922); cf. *C. A.* 16, 1269.—Twelve preps. of protein from 5 individuals were used. One of these was cryst. and acted as a single antigen. The others contained traces of serum proteins. The immunological reactions indicated that there are certainly 2, possibly 3, groups of proteins included in the term "Bence-Jones protein."

I. GREENWALD

**The alveolar and blood gas changes following pneumectomy.** G. J. HEUER AND W. D. W. ANDRUS. *Bull. Johns Hopkins Hosp.* 33, 130-4(1922).—In dogs, after the removal of one lung, there was an initial fall in alveolar  $\text{CO}_2$  due to the anesthesia, with a subsequent slow rise to about 10% above normal by about the 11th day, after which there was a slow return to the normal which was reached about the 25th day. The  $\text{CO}_2$  content and capacity of the blood followed a similar course. The  $\text{O}_2$  content fell on the day of the operation and continued to fall for about 10 days, after which it returned to the normal. The  $\text{O}_2$  capacity of the blood was increased, with an increase in the red cell count of from 15 to 20%.

I. GREENWALD

**Physico-chemical investigations on the formation of gallstones.** N. A. BOLT AND P. A. HERRGES. *Klin. Wochschr.* 1, 124(1922).—A surviving frog liver was transfused with a modified Ringer soln. of  $p_{\text{H}} = 8.0$ . The biliary secretion was full of tiny concretions, largely cholesterol. The addn. of a small amt. of gelatin to the transfusion liquid gave rise to a secretion of bile that was free from concretions. The authors conclude that the concretions appeared in the first expt. because the transfusion liquid was deficient in colloids. A clear biliary excretion is also obtained when lecithin is added to the transfusion liquid. Also in *Arch. ges. Physiol. (Pflügers)* 193, 449-58(1922).

MILTON HANKE

**An investigation into the etiology of dental caries. I. The nature of the destructive agent and the production of artificial caries.** J. MCINTOSH, W. W. JAMES AND P. L. BARLOW. *Brit. J. Exptl. Pathol.* 3, 138-45(1922).—The examn. of selected carious material showed the const. presence of a definite type of bacillus. The bacilli are capable of producing a high degree of acidity by the fermentation of carbohydrates. The av. final  $p_{\text{H}}$  value of 9 strains was 2.75, which is sufficient to decalcify teeth. Teeth left in contact with pure cultures over prolonged periods showed changes almost identical with those found in natural caries. Such teeth show erosion of the enamel with penetration of the dentinal tubules and the formation of liquefaction foci. The bacilli, to which it is proposed to give the name *B. acidophilus odontolyticus*, in their resistance to

and formation of acid resemble the "acidophilus" group of Moro; biologically, however, there are several points of difference.

HARRIET F. HOLMES

**The relative values of human and guinea-pig complement in the Wassermann reaction.** A. F. HAYDEN. *Brit. J. Exptl. Pathol.* 3, 151-7(1922).—Among healthy human complements there is for practical purposes a const. ratio between the hemolytic titer and the capacity for being fixed with syphilitic antigen and antibody. This const. ratio enables the reaction to be standardized, and in this respect human complement is superior to that of the guinea pig in the Wassermann reaction. The fixation of human complement in the reaction is much more complete than that of the guinea pig and allows of a more delicate test without the use of cholesterolized antigen. The difference in delicacy observed in the active-serum methods is probably due to this greater fixation of human complement, and not to the absence of inactivation of the serum to be tested.

HARRIET F. HOLMES

**Isobemagglutination.** S. C. DYKE. *Brit. J. Exptl. Pathol.* 3, 146-50(1922).—Absorption tests performed on sera of Groups II, III and IV using corpuscles of Groups I, II and III confirm von Dungern and Hirschfeldt's (*C. A.* 5, 1126) hypothesis as to the distribution and nature of agglutinins and agglutinable factors in the four blood groups. Sera from different individuals of the same group vary in their agglutinating powers. The relative titer of the two agglutinins in any given Group IV serum may be equal or very unequal. Sera from different individuals of this group differ greatly in this respect. Corpuscles from different individuals of the same group vary as to their agglutinability by the same serum. The relative degree to which the agglutinable factors may be present in corpuscles from any individual belonging to Group I varies greatly; corpuscles from different individuals belonging to Group I differ in this respect.

HARRIET F. HOLMES

**Further experimental studies on immunization against *B. dysenteriae* (Shiga) and its toxins.** S. KANAI. *Brit. J. Exptl. Pathol.* 3, 158-72(1922).—The toxin of *B. dysenteriae* (Shiga) affects principally the central nervous system (medulla and spinal cord) in rabbits. At the same time it acts upon the capillary circulation generally with the production of congestion and hemorrhage in the various viscera. Exposure to a temp. of 80° for 1 hr. markedly reduces its toxicity, especially for the central nervous system. It has been impossible to effect a sepn. between exotoxin and so-called endotoxin on the lines of Olitsky and Kligler (*C. A.* 14, 1130). HARRIET F. HOLMES

**Study of tetany.** II. H. ELIAS AND ST. WEISS. *Weiner Arch. inn. Med.* 4, 59-64(1922).—Further study confirms an earlier report (Elias and Spiegel, *C. A.* 16, 286) that there is an increase in inorg. and total P in the blood serum of patients with tetany. Neither the inorg. nor the total P values fall wholly to normal with recovery and occasionally may be higher than during the attack.

HARRIET F. HOLMES

**Hyperglucemia in conditions with high blood pressure.** H. KAHLER. *Wiener Arch. inn. Med.* 4, 129-48(1922).—In the majority of cases of long continued high blood pressure the blood sugar value remains normal. Hyperglucemia occurs in complicating conditions such as apoplexy, eclamptic and uræmic conditions, in some cases of "essential hypertonia" and in cases of passive congestion with high blood pressure. Individuals with a normal and with a high blood pressure react in a simple manner to adrenaline injections. This, combined with the lack of hyperglucemia in uncomplicated cases, makes it improbable that a hyperadrenalinemia can be the cause of the increased blood pressure. In passive congestion with high blood pressure there is always hyperglucemia. This cannot be explained by the dyspnoea or by the passive congestion of the liver. It is possible that in these cases there is a hyperadrenalinemia.

H. F. H.

**Familial hemachromatosis.** A. V. FRISCH. *Wiener Arch. inn. Med.* 4, 149-186 (1922).—Hypofunction of the reticulo-endothelial system with regard to the Fe mol.



is given as the cause of hemachromatosis. The case studied showed the classical symptoms of bronzed discoloration of the skin, cirrhosis of the liver with deposition of pigment and diabetic coma with pancreatic insufficiency. It is of interest that this is a familial type of hemachromatosis as the mother and seven brothers and sisters were said to show bronzing of the skin and two of the brothers who came under observation gave evidence of cirrhosis of the liver.

HARRIET F. HOLMES

**Total nitrogen and residual nitrogen content of edematous fluids.** RUDOLPH STRISOWER. *Wiener Arch. inn. Med.* 4, 115-20(1922).—The content in residual N (R. N.) of edematous fluids parallels the total protein content. Normal values of R. N. lie between 0.02 and 0.05%. If over 0.06%, there is an increase. An increase of R. N. in the edematous fluid is found in cardiac insufficiency, arteriosclerosis of the kidney and chronic parenchymatous nephritis. Usually the R. N. value of the edematous fluid is higher than that of the blood. No direct relation could be made out between the uremia and the increase of R. N. in the edematous fluid.

HARRIET F. HOLMES

**The serodiagnosis of echinococcus infection.** GEORG BLUMENTHAL. *Berl. klin. Wochschr.* 58, 1067-9(1921).—The details of the complement-fixation test for echinococcus infection are emphasized. The titration of complement and amboceptor must be accurate. For antigen the fluid from an echinococcus cyst is used. The alc. ext. of the wall is worthless. The antigen must be negative with a normal serum and positive with a Wasserman-positive serum and strongly positive with the serum from a known positive echinococcus infection. The results are interpreted just as a Wassermann result is.

JULIAN H. LEWIS

**An improved method for the Wassermann reaction.** H. SACHS. *Berl. klin. Wochschr.* 58, 1075-6(1921).—Since the anticomplementary constituent of a luetic serum is in the most labile fraction of the globulin, S. attempts to ppt. this before performing the Wassermann reaction. To 0.5 cc. of the inactive sera 4.1 cc. of  $NHCl$  is added. After 0.5-1 hr. the ppt. is centrifuged off and to the supernatant fluid is added 0.4 cc.  $N NaOH$  in 10%  $NaCl$ . This soln. is used for the Wassermann test.

JULIAN H. LEWIS

**Immunization in relation to the condition and amount of antigen.** M. v. EISLER. *Centr. Bakt. Parasitenk., Abt. I* 79, 291-302(1917).—The soly. relations, affecting their absorptivity, is of the greatest significance for antigens in producing immunization. Antigens in easily assimilated form, as tetanus toxin and heated bacterial suspensions, produce, after 1 injection, the same amount of antibodies as when an equal amt. is divided among several injections. Antigens absorbed with difficulty, as carbolized bacterial suspensions, require a no. of injections to produce a worth-while amt. of antibodies. Between antitoxin production and the amt. of toxin injected there is a relation, in as much as exact doses of toxin produce an exact amt. of antitoxin. In agglutinin formation, also, the antigen and amt. of agglutinin formed are related, as the larger the amt. of antigen injected the larger the amt. of antibodies produced. J. H. L.

**The rest nitrogen of the blood in arteriosclerotic hypertension. A contribution to the knowledge of kidney function in benign nephrosclerosis.** OTTO KLEIN. *Dent. Arch. klin. Med.* 138, 82-119(1921).—In more than 50 cases of high arteriosclerotic hypertension, most of which were of long standing, over  $\frac{2}{3}$  showed a marked kidney disturbance as reflected in a great increase in the rest N of the blood. This disturbance of the kidneys as well as that of other organs is periodic, and is due to an increased obstruction in the arterial bed from a function contraction of the small arteries. A weakened condition of the left ventricle with a lowered driving force may play a role. In malignant sclerosis the obstruction is due to anatomic changes and is permanent.

JULIAN H. LEWIS

**The action of intravenous injection of sodium chloride in pneumonia and in health.**

**RICHARD PRIGGE.** *Deut. Arch. klin. Med.* 139, 1-32(1922).—When large quantities of concd. solns. of NaCl (20-38 g.) are injected intravenously into man, most of the Cl disappears immediately from the circulation without appearing in the urine. In healthy men the retained NaCl is excreted within 2 days. The Cl retention is highest immediately after injection and begins to decrease soon after injection. J. H. L.

**The determination of uric acid in the blood in the diagnosis of gout.** S. J. TRANN-HAUSER AND M. WEINSCHENK. *Deut. Arch. klin. Med.* 139, 100-10(1922).—The pathogenesis of the gouty arthritis is not the entity that constitutional gout is. The latter is the result of a disturbed excretion of uric acid while in arthritis the excretion may be normal. The arthritis is caused by a local sensitiveness to different endogenous and exogenous metabolic products to which the normal organism does not react.

JULIAN H. LEWIS

**The adrenaline test in diabetes.** W. H. VEIL AND A. RESIERT. *Deut. Arch. klin. Med.* 139, 235-44(1922).—Adrenaline injected into diabetics caused an increase in the blood sugar, the urinary sugar, and the acids in the urine, and changes in the blood pressure. The degree of these changes, the shape of the curve that is produced and the percentage of times these reactions occur depend on the degree of diabetes.

JULIAN H. LEWIS

**The catalase content of the blood in pernicious anemia.** HELLMUT KORALLUS. *Deut. Arch. klin. Med.* 139, 252-6(1922).—While the highest blood values for catalase were found in pernicious anemia, there were extreme fluctuations so that often the lowest values were the same as the lowest values in health and in other diseases. The diagnostic values of catalase detns. in pernicious anemia are doubtful. A series of detns. should be made and the fact kept in mind that the results are affected by many extraneous factors.

JULIAN H. LEWIS

**The precipitin reaction in the determination of the infectivity of gonorrheal discharges.** MARGARET F. KELLEY. *J. Infectious Diseases* 30, 623-35(1922).—Although reactions are obtained when exts. of discharges from gonorrheal patients are added to the serum of a rabbit immunized with gonococci, similar reactions are frequently encountered with the serums of normal rabbits. Likewise, exts. of material from the genital organs, known not to be infected with the gonococcus, as well as exts. of exudates due to infection by other organisms, give reactions with both antigenococcus serum and normal serum. Attempts to exclude the non-sp. factor and thus obtain a sp. reaction have failed. Dilm. of serum, of ext., or of both, has not served to differentiate between a sp. and a non-sp. reaction. Likewise, absorption of the antigenococcus serum by heterologous bacteria has failed to eliminate the non-sp. factor. This non-sp. factor has obscured any reaction which might have occurred between the gonococcus serum and any gonococcus precipitinogen which might have been present in the known gonorrheal specimen. Comparison between the probable amt. of gonococcus substance present in the specimens as indicated by smear examn. with the no. of organisms necessary in a suspension to give a satisfactory precipitating antigen raises a strong presumption that a sp. ppt. development occurs infrequently if at all. When the gonococcus precipitins were absorbed from the serum, there was no uniform diminution in the reaction obtained with exts. from gonorrheal cases. The precipitin reaction as recommended by Robinson and Meader (*J. Urol.* 4, 441(1920)) is not applicable for the detn. of the presence of the gonococcus in discharges from the cervix, urethra, etc.

JULIAN H. LEWIS

**Hydrogen-ion studies. III. Hydrogen-ion changes in the agglutination of bacteria by immune serum.** E. F. HIRSCH. *J. Infectious Diseases* 30, 651-7(1922); cf. C. A. 16, 1806.—Bacteria suspended in normal soln. behave chem. and electrically like the anion of the salt of a strong base and a weak acid. When bacteria are agglutin-

ated by homologous immune serum, the medium in which this reaction occurs increases in alkalinity. This change in reaction is regarded as resulting from differences in the dissoc. consts. of the reacting substances and their products. **IV. Changes in reaction accompanying the precipitation of colloidal gold by spinal fluid (Lange test).** *Ibid* 658-63.—The agglutination of colloidal Au particles by spinal fluid is accompanied by an increase in the alkalinity of the medium in which this reaction occurs. This change in reaction is similar to that observed on the agglutination of bacteria by homologous immune serum. **V. Changes in the reaction of the blood in experimental infections.** EDWIN F. HIRSCH AND J. L. WILLIAMS. *Ibid* 664-5.—The intravenous injection of pathogenic bacteria into rabbits diminishes the alkalinity of the blood as well as the alk. reserve. The H-ion concn. of the blood may become so great that the reaction becomes acid. **VI. Hydrogen-ion changes on precipitation of human serum by immune serum.** EDWIN F. HIRSCH. *Ibid* 666-9.—The pptn. of human serum by homologous immune serum is accompanied by an increase in the alky. of the medium similar to that observed on the agglutination of bacteria by immune serum and on the pptn. of colloidal Au by spinal fluid.

JULIAN H. LEWIS

**The chemical composition of the blood of pellagrins.** R. C. LEWIS. U. S. Public Health Service, *Hygienic Bull.* No. 116, 37-43(1920).—In the blood of a no. of pellagrins detns. of total non-protein N, urea, sugar, chlorides, Na, K, Ca and Mg were made. Low total non-protein N and urea figures were found for 1 group of patients and are attributable to the comparatively low protein content of their diet. With these exceptions no variation from the normal was found.

JULIAN H. LEWIS

**The amino acid fractions and hippuric acid in the urine of pellagrins.** J. R. MURLIN. U. S. Public Health Service, *Hygienic Lab. Bull.* No. 116, 45-72(1920).—The imperfect gastric digestion, established in 50-60% of the cases of pellagra, might be expected to lead to imperfect assimilation of protein material and the production of toxic imperfectly split substances which might be eliminated in part unchanged in the urine. It is clearly suggested, by comparison of 2 subjects, one without free acid and pepsin in the stomach and the other with normal gastric juice, that the quantity of formol-titration N in the urine may depend on gastric conditions. The quantity of hippuric acid excreted by pellagrins, especially those kept on a corn-vegetable diet, is from 2-3 times the quantity excreted by normal men on a general mixed diet. The question may be raised whether this does not denote an intestinal condition capable of producing toxins which may have far-reaching somatic effects.

JULIAN H. LEWIS

**Feeding experiments with the Rankin farm pellagra-producing experimental diet.** M. X. SULLIVAN. U. S. Public Health Service, *Hyg. Lab. Bull.* No. 120, 141-53 (1920).—The pellagra-producing diet of the Rankin farm expt. was toxic for pigeons; for hens it was primarily lacking in the antineuritic principle; for rats it was still further lacking for maintenance and growth. None of these animals showed pellagra-like symptoms, such as reddening of the skin, though all gave evidence of serious malnutrition.

JULIAN H. LEWIS

**The water content of the tissues in experimental beriberi.** D. J. KRAUSE. *Am. J. Physiol.* 60, 234-243(1922).—Exptl. beriberi was induced in chickens, pigeons, guinea pigs, and rats by feeding diets low in water-sol. B. vitamin. Quant. analysis (separate organs, or the entire animal) appears to reveal increased H<sub>2</sub>O content of the tissues (or incipient edema) in dietary deficiency diseases, where edema is not in evidence on the usual gross examn.

J. F. LYMAN

**Experimental traumatic shock. VI. The liberation of epinephrine in traumatic shock.** D. RAPPORT. *Am. J. Physiol.* 60, 461-75(1922).—In 6 out of 9 cases reported, there is evidence of hyperactivity of the adrenal glands during the development of traumatic shock. Neither over-production nor exhaustion of the adrenals are probable

factors in the *production* of shock; rather the over-activity of the glands is a conserving factor.

J. F. LYMAN

**The fat of adipose tissue in malignant disease.** A. N. CURRIE. *J. Path. Bact.* 25, 213-27(1922).—There is a constancy in I value in fat from any part of the normal body. In malignant disease there are marked differences which are dependent on the nature of the disease and the locality relation of the adipose tissue to the seat of disturbance. The fatty unsatn. finds its highest expression in local carcinomatous fat. Fats local to sarcomata and chronic inflammatory lesions have an I value intermediate between that of carcinomata and normal fat.

JOHN T. MYERS

**Further observations on the Wassermann test with prolonged fixation at ice-chest temperatures (with a note on tests with Bordet's antigen).** E. J. WYLER. *J. Path. Bact.* 25, 271-8(1922); cf. *C. A.* 15, 3078.—In treated cases the cold fixation yields a higher percentage of positives than fixation at 37°, but very occasionally there may be less fixation by the cold method. In untreated cases the cold method does not seem appreciably more sensitive.

JOHN T. MYERS

**The reaction of the blood in relation to dyspnea.** F. R. FRASER, J. P. ROSS AND N. B. DREYER. *Quart. J. Med.* 15, 195-206(1922).—The colorimetric method for detg. the reaction of the blood by dialysis can be simply applied to clinical investigation by means of arterial puncture. The av. reaction of the blood in healthy young adults by this method is  $p_H$  7.68. The limits in health are 7.72-7.64. In health the reaction of venous blood is approx. the same as that of arterial blood. In heart failure with valvular disease the reaction becomes more alk. Dyspnea is found associated with alkalemia as well as with acidemia. Pronounced acidemia may be present without dyspnea. Reactions of arterial blood as alk. as  $p_H$  7.95 and as acid as 7.37 are compatible with life.

JOHN T. MYERS

**The excretion of potassium iodide in the urine in health and disease; its use as a test of renal function.** G. C. LINDER. *Quart. J. Med.* 15, 227-43(1922).—The iodide test is a reliable indication of nephritis when the excretion falls below 35% in the first 12 hrs. A reduction of the output to 15% or less is an indication of very advanced progressive disease and often foretells early death.

JOHN T. MYERS

**Researches on the complement-fixation reaction in hydatid disease.** N. H. FAIRLEY. *Quart. J. Med.* 15, 244-67(1922).—The complement-fixation reaction proved an absolutely specific test.

JOHN T. MYERS

**Nephropathic hypercholesterolemia and the problem of its control by diet.** HANS BRUMER. *Arch. Kinderheilk.* 68, 105-16(1921).—No increase in serum cholesterol was found in mild and severe cases of acute hemorrhagic nephritis in children. After the subsidence of the acute stage a small increase may occur. In other forms of chronic nephritis of various types the serum cholesterol is greatly increased, in some cases to 690 mg. per 100 cc., the increase being apparently independent of concomitant edema, albuminuria and fever. The cholesterolemia does not appear to be the result of abnormal cholesterol metabolism, nor does it yield to treatment with fat- and lipid-free diets.

W. A. PERLZWEIG

**Colloidal benzoïn reaction on cerebrospinal fluid for the diagnosis of syphilis of the nerve centers and of tuberculous meningitis.** M. VALIN. *Rept. pharm.* 34, 144-6(1922).—A modification of the method of Guillain, Laroche and Lachelle (*C. A.* 15, 391, 1928). The colloidal benzoïn and 0.1% NaCl solns. are prep'd. as given in *C. A.* 15, 391. Sixteen tubes are used instead of 8. Tube 1 contains 0.25 cc. NaCl and 0.75 cc. cerebrospinal fluid; tube 2, 0.5 cc. NaCl and 0.5 cc. of the fluid; tube 3, 0.75 cc. NaCl and 0.25 cc. of the fluid; in each of the tubes 4-16 is placed 2 cc. of NaCl soln. and 1 cc. of the contents of tube 3 is transferred to tube 4 and mixed, then 1 cc. from tube 4 is transferred to tube 5, etc., until tube 15 is reached. Tube 16 is held as a control. The

tubes 1-15 contain the concns. of spinal fluid  $2/4$ ,  $1/2$ ,  $1/4$ ,  $1/8$ ,  $1/16$ , etc. Tube 15 contains  $1/1684$ . To each of the 16 tubes 1 cc. of the benzoïn soln. is added and the tubes are examd. after 12 hrs. Normal spinal fluid sometimes gives a ppt. of cloudiness in tubes 6, 7, and 8 but not in the others. In tabes, general paralysis or other syphilitic lesions of the central nervous system, a pptn. occurs in tubes 8-15. The reaction is explained by V. on the basis of increased concn. of globulin and serine in the cerebrospinal fluid in the pathol. states.

W. A. PERLZWEIG

**Colored colostrum.** ERNST REICHENFELD. *Wiener klin. Wochschr.* 34, 4(1921).—A light green secretion was obtained from a woman with probable abortion and with uterine and ovarian inflammation. The chem. examn. of the fluid showed presence of blood pigments and possibly indigo blue.

W. A. P.

**Intoxications with protein-split products.** HERMANN PFRIFFER. *Wiener klin. Wochschr.* 34, 69(1921).—A study of the quant. relation of temp. fall to various anaphylactic and photodynamic injuries in animals. Keeping animals in incubators at  $37^{\circ}$  during or shortly after exposure to shock appeared to have protected them from permanent injury and from death.

W. A. PERLZWEIG

**The cytolytic reaction.** ERNST FREUND. *Wiener klin. Wochschr.* 34, 130-1(1921).—The etiology of carcinomatous growth is discussed on the basis of the following 3 essential causes: congenital germ-plasma defect, infection, and disturbance of metabolism. Experimentally it was found that the active substance of normal serum which can destroy cancer cells is a satd. fatty dicarboxylic acid, sol. in  $\text{Et}_2\text{O}$  and N-free. Of all the dicarboxylic acids tested *in vitro*, only succinic, suberic and decamethylenedicarboxylic acids have this property, the extent of the cytolytic effect being proportional to the uneven  $\text{C}_2\text{H}_4$  groups, the acids with even  $\text{C}_2\text{H}_4$  groups having no such effect. The mol. wt. of the cytolytic substance in normal serum is twice that of decamethylenedicarboxylic acid. The active, protective substance of carcinomatous serum is attached to the  $\text{Na}_2\text{CO}_3$ -sol. portion of the euglobulin fraction (nucleoglobulin). This nucleoglobulin differs from the nucleoglobulin of normal serum by its content of carbohydrate and of an unsatd. fatty acid compd. of the dicarboxylic acid series. The protective property was also found *in vitro* in maleic, methylenesuccinic and citraconic acids and in other dicarboxylic acids in which the two  $\text{COOH}$  groups are in close proximity. Isomers of these, such as fumaric and mesaconic acids, do not show the protective property. Attention is called to the close chem. relationship of the substances responsible for both the lytic and protective properties and to the ease with which one group of compds. can be chem. transformed into the other. Local and general dispositions to cancer growth are further discussed in terms of the absence of normal lipoids and the presence of pathological lipoids, resp.

W. A. PERLZWEIG

**Chondroitinuria in pulmonary tuberculosis.** KARL DIETL. *Wiener klin. Wochschr.* 34, 133(1921).—The following findings are reported on the study of the urine of 175 cases of severe pulmonary tuberculosis: 11.4% gave a positive albumin reaction; 42.8% showed presence of  $\text{AcOH}$  pptd. albumin and of chondroitin-albumin; 92.8% showed the presence of chondroitin- $\text{H}_2\text{SO}_4$ . The relation of chondroitinuria as a symptom of renal involvement peculiar to tuberculosis is discussed.

W. A. PERLZWEIG

**The negative and positive phases of tuberculin sensitivity.** F. HAMBURGER AND K. PHRYER. *Wiener klin. Wochschr.* 34, 157(1921).—A general theoretical discussion. Cf. C. A. 16, 2361.

W. A. PERLZWEIG

**The influence of alcohol upon the precipitation of the lipid antigen.** RUDOLPH MÜLLER. *Wiener klin. Wochschr.* 34, 196-7(1921).—In the prepn. of the lipoidal heart ext. antigen for the Wassermann reaction, the lipid can be pptd. not only by increasing the concn. of  $\text{NaCl}$  but also by increasing the concn. of alc. W. A. P.

**The theory of serology of syphilis.** EMIL EPSTEIN AND FRITZ PAUL. *Wiener*

*klin. Wochschr.* 34, 254-5(1921).—An attempt to coördinate the Meinicke (D. M.) and Wassermann reactions. Cf. *C. A.* 16, 1459. W. A. PERLZWEIG

**Calcium metabolism and internal secretions.** JULIUS BAUER. *Wiener klin. Wochschr.* 34, 814-5(1921).—A review of Ca metabolism and of the relation of the glands of internal secretion to rickets, osteomalacia, tetany, etc. W. A. P.

**Diagnostic value of increased globulin in cerebrospinal fluid in children's diseases.** H. BAAR. *Wiener klin. Wochschr.* 34, 614-5(1921).—The globulin and total protein were detd. in the cerebrospinal fluid of a number of organic and functional diseases of the nervous system in children. It was found that an increase in globulin is characteristic of organic and of a series of functional diseases of the nervous system. The PhOH reaction of Pandy (*C. A.* 5, 3087) must be interpreted in terms of intensity. By this test in most functional nervous diseases the globulin content is less than 0.066%. In uremic eclamptic attacks and especially in recurrent spasmodic convulsions the globulin increase is of the same order as that in tuberculous meningitis. In "functional" convulsions the globulin content is highest during the period of attack and falls with the subsiding of the convulsions while in tuberculous meningitis it increases steadily until death. In a number of organic disorders of the central nervous system, diagnostically differentiated from tuberculous meningitis, the same progressive increase of globulin is observed. The diagnostic value of Pandy's PhOH reaction in the study of nervous diseases is emphasized. W. A. PERLZWEIG

**Studies in the standardization of the Wassermann reaction.** XXX. JOHN A. KOLMER. *Am. J. Syphilis* 6, 82-110(1922).—K. proposes a standardized method for conducting the Wassermann reaction. The procedures advocated are based upon the results recorded in the earlier papers of the series. Cf. *C. A.* 14, 2657.

G. H. SMITH

**Photodynamic action of extracts of various grains with special reference to pellagra.** DOUGLAS M. GAY AND MONROE A. McIVER. *Am. J. Trop. Med.* 2, 115-22(1922).—The studies of the photodynamic action of the pigments of certain grains do not prove the theory of photodynamic action in pellagra, nor are they inconsistent with such a theory. It was found that alc. exts. of yellow corn, rye, oats, and buckwheat possess fluorescent properties, and that aq. exts. of these pigments produce photodynamic hemolysis *in vitro*. G. H. S.

**Sprue, a mycosis superimposed upon a state of deficiency in certain essential food elements.** B. K. ASHFORD. *Am. J. Trop. Med.* 2, 139-50(1922).—Typical sprue is most frequently preceded by a physiol. glandular deficiency, with a marked reduction in the output of the pancreas and the intestinal glands. The dietary deficiency (too little fresh animal protein, fat-sol. A, and certain minerals) leads to a change in the reaction and compn. of the intestinal contents which allows the implantation of *Monilia psilosis*. This sequence of events (food deficiency and the infection) also occurs in the thrush. G. H. S.

**Globulin content of blood serum in syphilis.** MAX E. BIRCHER AND A. R. McFARLAND. *Arch. Dermatol. & Syphilol.* 2, 215-33(1922).—Detns. of the albumin-globulin ratio of the serum in syphilitics were made by viscosimetric and refractometric means. A high globulin ratio was usually found. G. H. S.

**Etiology of cholelithiasis.** ALFRED GREM. *Arch. expil. Path. Pharm.* 92, 183-93(1922).—Of 386 patients operated upon at the Heidelberg Clinic for gall stones but 46 were male, and of the 340 females 90% referred the condition to pregnancy. It is pointed out that in pregnancy there is a cholesterolemia as well as an erythrolysis which may contribute to the increased cholesterol of the bile. These conditions, together with a variety of physiol. and pathol. states which may result in bile concn., form a vicious circle. G. H. S.

**Serologic investigation of the structure and origin of blood platelets.** F. ROSENTHAL AND C. FALKENHEIM. *Arch. expul. Path. Pharm.* **92**, 231-53(1922).—By means of agglutination tests employing immune sera to sp. blood elements and the various types of cell as agglutigen a relationship indicating structure and origin among the cellular elements was demonstrated. Erythrocytes possess an antigenic structure (E receptors) quite distinct from that of the platelets and leucocytes (L receptors). Erythrocytic immune sera are highly agglutinating for red cells but fail entirely or are but slightly agglutinative for platelets and spindle cells. In the same way platelet antisera or spindle cell agglutinating sera are relatively inactive as regards red cells. On the other hand, leucocyte immune sera agglutinate both red and white cells, and platelets as well. Thus the leucocytes must possess a structure comprizing receptors of both the E and L types. From the point of view of receptor structure the erythrocytes and platelets (also spindle cells) present significant differences, while with the cells of the leucopoietic system the blood platelets possess a common receptor structure, indicating a leucocytic origin for the platelets. G. H. S.

**Diagnosis and therapy of intestinal bilharziosis.** R. HÖPPLI. *Med. Klin.* **18**, 50(1922).—The complement-fixation reaction is advocated as a diagnostic procedure. The repeated intravenous injection of solns. of tartar emetic provides a sp. therapy. G. H. S.

**Congo rubin for the diagnosis of neurosyphilis.** F. v. GUTFELD AND E. WRIGHT. *Med. Klin.* **18**, 148-9(1922).—Congo rubin possesses many properties in common with colloidal gold and in aq. soln. is on the borderline between mol. and colloidal systems, changing color in accordance with the degree of dispersion. It has been advocated for use in the diagnosis of neurosyphilis, being employed after the manner of colloidal gold. In the series of cases tested the Congo rubin the reaction agreed with the Wassermann and Lange tests in rather less than 50% of the fluids examd. G. H. S.

**Occurrence of aldol in diabetic urine.** R. FRICKÉ. *Z. physiol. Chem.* **118**, 218-23(1922).—Using 50 l. of diabetic urine F. confirmed his previous finding (C. A. **16**, 2525) of aldol. Only a few mg. were present. No theoretical explanation for its occurrence is apparent. R. L. STEHLE

## H—PHARMACOLOGY

ALFRED N. RICHARDS

**The inhibitory action of barium, strontium and calcium chloride in blood coagulation.** J. LEHMANN. *Skand. Arch. Physiol.* **42**, 35-42(1922).—The addn. of very small amts. of either BaCl<sub>2</sub>, SrCl<sub>2</sub> or CaCl<sub>2</sub> to normal blood does not accelerate coagulation. In fact an inhibiting effect is observed in the ascending series Sr < Ca < Ba. BaCl<sub>2</sub> retards coagulation when present in a 0.07% concn. of the blood, if the blood mixt. be made 1:1 with NaCl soln. F. S. HAMMETT

**Protein destruction in poisonings.** G. GLAUBITZ. *Z. ges. expul. Med.* **25**, 230-51(1921).—CO poisoning, even in mild form, produces marked increase in protein disintegration which lasts for a considerable length of time. Oxalic acid poisoning results in a great increase in protein metabolism. The peak of N excretion is reached several days later following tubular nephritis. Lysol is about intermediate when given in large doses; small doses have little effect upon protein metabolism. HgCl<sub>2</sub> in a dose of 0.1 g. produces a marked increase in N excretion. After 8 yrs. of morphine addiction (highest dose 1.8 g. per day) there was no marked change in protein metabolism.

E. B. FINK

**Biochemical studies in a fatal case of methanol poisoning.** I. M. RABINOVITCH. *Arch. Intern. Med.* **29**, 821-7(1922).—In a woman of 70 yrs., suffering from MeOH poisoning, there was a progressive increase in the uric acid (9.3 mg. per 100 cc.), urea

N (144 mg.), creatinine (4.5 mg.) of the blood and a decrease in the  $\text{CO}_2$  of the plasma (26%) and the % O<sub>2</sub>-satn. of the blood (15.5%) to death, which occurred 6 days after she had taken the MeOH. The figures in parentheses represent the final values. On the last 3 days the acid-sol. P varied between 8.6 and 10.8 mg. per 100 cc. blood, and the glucose content was 225 mg. per 100 cc. There was no methemoglobin in the blood. The stomach was removed at autopsy, hashed and tested for MeOH, which was found.

I. GREENWALD

**Theory of narcosis.** H. H. MEYER. *Wiener klin. Wochschr.* 34, 300-1 (1921).—No new data are given. Narcosis is discussed from the standpoint of soly. of the nervous tissue of lipoids in the various anesthetics, and some quant. relations are stated.

W. A. PERLZWEIG

**Arsenic in therapy.** H. W. SMITH. *J. Am. Pharm. Assoc.* 11, 423-33 (1922).—Essay embracing the history of As from early times to its extensive use in modern medicine.

L. B. WARREN

## I—ZÖÖLOGY

R. A. GORTNER

**The adaption of albino mice to an artificially produced tropical climate.** I. **Effect of the various factors composing a tropical climate on growth and fertility in mice.** E. S. SUNDSSTROM. *Am. J. Physiol.* 60, 397-415 (1922).—Confinement in a stagnant, hot and humid atm. retards the growth of mice that are transferred to the new climatic conditions immediately after separation from their mothers. Succeeding generations of mice born in a hot and humid environment behave differently in their reaction to this environment. It is suggested that a racial adaptation may finally occur. Exposure to artificial light at ordinary temp. accelerates growth of white mice; in hot humid atms. exposure to light has a further retarding effect on growth. Circulation of hot humid air neutralizes partly the unfavorability of the tropical environment for the growth of animals. The growth of males is less retarded by unfavorable climatic environment and more accelerated by stimulating factors than the growth of females. Fertility of mice is not necessarily diminished by confinement in humid heat for several generations. II. **Relations of the body form and especially the surface area to the reactions released by and the resistance to a tropical climate.** *Ibid* 60, 416-24.—There is evidence that white mice grown in a hot atm. possess a greater body surface in proportion to wt., than mice grown under normal conditions. Exposure to humidity and light do not result in an acquired resistance to higher temp. III. **Effect of the tropical climate on growth and pigmentation of hair and the dependence of these integumental functions on the temperature coefficient law.** *Ibid* 60, 425-33.—Hair growth is more rapid in cool atms. The hair of recessive white mice, may, when exposed to humid heat or to the radiation of strong light, acquire the power of producing pigment. It is suggested that the theory that recessive albinos lack the pigment-producing enzymes is false and that failure to ext. this enzyme may be due to its presence only in minute amts. It is also suggested that chem. processes that control the growth and pigmentation of hair may possess different temp. coeffs. Cool climate favors hair growth; hot climate pigment formation. IV. **Effect of heat and light in resistance of mice to acetonitrile.** *Ibid* 60, 434-42.—The resistance of mice to MeCN is not augmented in humid heat, but rather reduced. This is regarded as evidence that the retardation of growth in humid heat is not due to a stimulation of thyroid activity. The resistance of mice exposed to strong light at ordinary room temp. is slightly diminished. J. F. L.

**The effect of ether upon the migration of the scale pigment and the retinal pigment in the fish, *Fundulus heteroclitus*.** L. C. WYMAN. *Proc. Nat. Acad. Sci.* 8, 128-30 (1922).—The retinal pigment is arrested in the condition in which it is found when the



fish is etherized. The pigment of the scale melanophores, however, shows a complete distal migration, the reverse of the effect produced by adrenaliné. (See following abstr.)  $\text{Et}_2\text{O}$  removes the nervous tonus of the scale melanophores allowing the melanophores to expand. It inhibits the activities of the retinal melanophores which are not controlled by motor nerve fibers.

CHAS. H. RICHARDSON

The diverse effects of adrenaline upon the migration of the scale pigment and the retinal pigment in the fish, *Fundulus heteroclitus* Linn. A. S. GILSON, JR. *Proc. Nat. Acad. Sci.* 8, 130-3(1922).—Injection of adrenaline causes a distal migration of pigment processes in the retinas of dark animals, but produces no significant change in the retinas of the already extended processes of light animals. Adrenaline causes a marked proximal migration of pigment in the scale melanophores.

CHAS. H. RICHARDSON

## 12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

Determination of the chlorides in food substances. M. BORNAND. *Mitt. Lebensm. Hyg.* 13, 67-8(1922).—The method detcs. rapidly and accurately chlorides in urine, pathological liquids and food substances without ashing. Add to a weighed amt. of the substance 20-30 cc. of  $\text{H}_2\text{O}$ , 5-20 cc. of concd.  $\text{HNO}_3$ , 20 cc. of 0.1 N  $\text{AgNO}_3$ . Heat over a small flame and add 1-5 g.  $\text{K}_2\text{S}_2\text{O}_8$  in small amts. After 5-15 min., when the mixt. is clear, add some cc. of Fe alum soln., dil. with 100 cc. of  $\text{H}_2\text{O}$  and titrate with 0.1 N  $\text{NH}_4$  thiocyanate. The difference between the amt. of  $\text{AgNO}_3$  used for the pptn. of the chloride and the amt. of the thiocyanate used multiplied by 0.00585 gives the amt. of NaCl in the substance. With albuminoid substances, add 5 cc. of an aldehyde at the end of the reaction.

DOROTHY B. SCOTT

Determination of water in food. C. BAKKER AND A. J. STEENHAVER. *Chem. Weekblad* 19, 285-6(1922).—The authors review the work of others. Comparative tests show that none of all of the methods proposed gives the real moisture content. All methods give relative values; an accurate observation of the conditions described is, therefore, necessary in order to obtain identical results. The distn. method is recommended, especially for spices. The  $\text{CaC}_2$  method should be worked out in detail. R. B.

The phytin content of foods. E. ARBENZ. *Mitt. Lebensm. Hyg.* 13, 45-52(1922).—Finely pulverized foods (vegetables and fruits dried first at  $36^\circ$ ) were extd. with definite quantities of 0.6%  $\text{HCl}$  until all phytin was removed. As many as 12 extns. were sometimes necessary. The phytin was detd. in the exts. by an adaptation of the method of Heubner and Stadler (*C. A.* 8, 3569). The % phytin as  $\text{H}_2\text{O}$ -free phytic acid, found resp. in fresh and dried foods was rice bran 3.801, 4.232; rice flour 0.192, 0.216; wheat bran 4.641, 5.073; whole-wheat flour 0.498, 0.572; white flour 0.184, 0.208; corn flour 0.764, 0.857; lentils 0.292, 0.326; peas 0.498, 0.561; oat flour 0.460, 0.506; cocoa 2.110, 2.230. No phytin was found in carrots, turnips, cauliflower, Brussels sprouts, kale, spinach, asparagus, apples, peaches and figs.

H. A. LEPPER

Report of the Committee on Problems of Canning, American Public Health Association. *Am. J. Public Health* 12, 591-3(1922).—A review of current investigations.

NATHAN VAN PATTEN

Vitamins in canned foods. E. F. KOHMAN. *Bull. Natl. Canners Assoc.* No. 19L, 92 pp.(1922).—K. gives a complete review of the exptl. work done on vitamins A, B and C. Tables show the effect of canning operations on these food factors. Vitamins A and B are not appreciably affected by the heat applied in the processing of canned foods. Vitamin C in less acid foods is destroyed by heat, and not more in canning than in ordinary cooking. In acid products there is a negligible destruction of vitamin C.

when canned. Air destroys vitamin C; therefore, there is less destruction in processing canned foods than cooking them for the same time and at the same temp. in air. Vitamin C has been held in canned tomatoes for 3 yrs. with no apparent depreciation. Canning will be an ideal means of keeping vitamins over extended periods of time. A complete bibliography is attached.

DOROTHY B. SCOTT

**Dried milk.** TIMOTHY LEARY. *Bost. Med. Surg. J.* 186, 591-7(1922).—Arguments are given which demonstrate the advantages which should arise from the elimination of the substance, i. e.,  $H_2O$ , which gives to milk its perishable quality. J. H. L.

**Bacterial content of milk powder.** G. C. SUPPLEE AND V. J. ASHBAUGH. *J. Dairy Sci.* 5, 216-28(1922).—Bacteria over 1000 per g. in milk powder made by the Just process indicates recontamination, as the bacterial content of the powder is normally lower than that made by the spray processes. The bacterial content of powder immediately after drying and before recontamination is not affected by the no. of bacteria in milk prior to drying. Bacteria die off rapidly during storage and in normal powders reached approx. constancy after 2-4 mos. Large nos. in desiccated milk do not produce any detectable effect upon the keeping quality in the moisture concns. permitted in com. powders. Tables and charts are included.

DOROTHY B. SCOTT

**The structure of powdered milk and its possible relation to the keeping quality of whole milk powders.** L. S. PALMER AND C. D. DAHLE. *J. Dairy Sci.* 5, 240-5(1922).—The structure of whole milk powders made by the drum and spray methods is described. The presence of air within the granules of the powder made by the spray process is suggested as having an important bearing on the fact that the spray type of whole milk powder is especially inclined to undergo oxidative deterioration.

LILLIAN OFFUTT

**Titration methods for the determination of milk phosphates and their use in judging milk.** WILHELM MÜLLER. *Mitt. Lebensm. Hyg.* 13, 52-63(1922).—Gravimetric methods being tedious and long have prevented full use of the  $P_2O_5$  detn. as a diagnostic means to distinguish normal milk from that affected by diseased cows. Detns. on the ash include P in org. combination as well as original phosphates. A volumetric method is proposed to det. phosphates only. To 50 cc. milk in a 100-cc. flask add 0.5 cc. of Ambuhl's  $HgCl_2$  reagent (*C. A.* 13, 2095) shake, complete the vol. and filter. To 50 cc. of serum add 5 cc.  $AcONa$  soln. (100 g.  $AcONa$  and 100 cc. 30%  $AcOH$  to 1 l.) and boil. The ppt. formed will not interfere. Add  $UO_2(NO_3)_2$  soln. (35 g. pure crystal  $UO_2(NO_3)_2 \cdot 6H_2O$  per l.) from a buret as long as pptn. is certain. The end point is detd. by 10%  $K_4Fe(CN)_6$  on a spot plate by formation of a red-brown color. A blank is run on 50 cc.  $H_2O$  and is about 0.5 cc. The  $UO_2(NO_3)_2$  soln. is standardized by the above procedure against a soln. contg. exactly 10.085 g. of  $Na_2HPO_4 \cdot 12 H_2O$  in a l., the  $P_2O_5$  content of which is standardized gravimetrically and adjusted. One. cc. uranium soln. = 0.005 g.  $P_2O_5$ . The procedure, checked by gravimetric analysis, was found to be accurate. The % phosphates in the milk detd. with serum varied from 24 to 32 on normal milks and was never below 24% of the quantity of ash of the milk. Seven milks affected by various diseases varied from 20.6 to 5.7%. Comparisons are given between % phosphate in serum and in ash of milks.

II. A. LEPPER

**Investigation of milk sediment, and the importance of the streptococci test for judging milk.** A. H. VERNBAS. *Chem. Weekblad* 19, 283-4(1922).—For condemning all milk of cows affected with mastitis, it is not sufficient to test the mixed milk. It is important for that purpose to investigate carefully the milk sediment. In order to state whether *B. tuberculosis* is present a test on the animal is indispensable. R. B.

**Investigation of milk sediment and the importance of streptococci.** C. F. VAN OYEN. *Chem. Weekblad* 19, 284-5(1922).—The real importance of the presence of streptococci in the sediment of the milk is not yet cleared up sufficiently from a scientific standpoint.

R. BEUTNER

**Effect of colloids on the bacterial reductase test.** ARTURI I. VIRTANEN. *Kgl. Landbruks-Akad. Handl. Tid.* 61, 324-36(1922).—Tests were made with electrolytes and by increasing the colloidal content of milk by adding milk colloids from cream and condensed milk, also by adding gelatin, starch, egg albumin. It is concluded that the colloids from milk have no influence on the reductase test. Results with other colloids were uncertain.

C. O. SWANSON

**Effect of temperature on the percentage of fat in milk.** A. C. RAGSDALE and S. BRODY. *J. Dairy Sci.* 5, 212-5(1922).—Reference is made to other conditions which affect the percentage of fat in cow milk (C. A. 15, 4032). When all other conditions are approx. the same, the lower the environmental temp. within the observed limits, the higher is the % fat in cow milk.

LILLIAN OFFUTT

**Milk inspection.** IRA V. HISCOCK. *Am. J. Public Health* 12, 577-91(1922).—A chapter from the forthcoming report of the committee on Municipal Health Department Practice, in which milk inspection is generally considered in all of its aspects. A table giving data concerning the supervision of milk supplies in eighty-three American cities is given. Cf. C. A. 16, 1816.

NATHAN VAN PATTEN

**The influence of internal diseases of the cow on the condition of the milk.** KOBSLER. *Milch. Lebensm. Hyg.* 13, 112-7(1922).

H. A. LEPPER

**Bitter milk of advanced lactation.** L. S. PALMER. *J. Dairy Sci.* 5, 201-11(1922).—Bitter milk of advanced lactation is caused by the secretion of an active lipase in the milk which hydrolyzes the milk fat rapidly even at rather low temp. and so frees the lower volatile fatty acids especially butyric; this imparts in a large measure the bitter flavor and rancid odor to the milk. The difficulty, therefore, is not of bacterial origin and can be effectively retarded if not prevented entirely by heating the fresh milk to 75° for a few minutes. Tables on which these conclusions are based are given. L. O.

**The relation between the volatile and total acidity in starters and in cultures of *S. lacticus*.** W. A. CORDES and B. W. HAMMER. *Iowa Agr. Expt. Sta., Res. Bull.* 66, 130-6(1921).—From the data given it is evident that with a starter the % of total acidity represented by volatile acid is low when the total acid is low and gradually increases with an increase in the total acid until it reaches 10-15%, while with a culture of *S. lacticus* this percentage is more or less const. and never reaches the high value existing in the case of a starter. Considerable variation occurs in the volatile acid production in different starters.

J. J. SKINNER

**Whey butter.** H. H. DEAN. *Agr. Gaz. Canada* 9, 120-22(1922).—A joint dairy and bacteriol. study.

F. C. COOK

**Determination of sodium benzoate in oleomargarine.** EDW. D. DAVY. *J. Am. Pharm. Assoc.* 10, 458(1921).—To 100 g. of sample add 50 cc. of satd. NaCl soln. contg. 0.5% of NaOH, add phenolphthalein as indicator, heat to boiling, adding NaOH if necessary to maintain alk. Transfer to a separator while hot and reserve the aq. layer. Repeat the sepn. 5 times. Filter the combined aq. solns., and add 4 g. of NaOH and an excess of  $\text{CaCl}_2$  to the filtrate. Acidify with HCl and shake 5 times with 15 cc. each of  $\text{Et}_2\text{O}$ . Wash the  $\text{Et}_2\text{O}$  with  $\text{H}_2\text{O}$ , evap. spontaneously, dissolve the residue in neutral 50%  $\text{EtOH}$  and titrate with 0.1 *N* NaOH.  $\text{Cc. of } 0.1 \text{ } N \text{ NaOH} \times 0.0072 = \text{NaC}_6\text{H}_5\text{COO}$ .

L. E. WARREN

**Vitamins and the future of the margarine manufacture.** CASIMIR FUNK. *Chem. Age (N. Y.)* 30, 227-30(1922).—A general discussion of vitamin A (which it is claimed margarine lacks) and the effects caused by its absence is given. How margarine contg. vitamin A can be made is shown. Comparison is made of practical dietetic aspects of margarine with butter.

LILLIAN OFFUTT

**Science can make margarine richer than butter.** CASIMIR FUNK. *Am. Food J.* 17, No. 6, 7-10(1922).—An address discussing margarine from the vitamin standpoint.

Addition of small amt. of codliver oil will make the product both antirachitic and antiophthalmic.

H. A. LEPPER

**Egg products in China.** ANON. *Far Eastern Rev.* 18, 307-8(1922).—Liquid albumin is neutralized with  $\text{NH}_3$  after 2 or 3 days' fermentation, and dried in shallow pans coated with vaseline in rooms heated to  $140^\circ$ . Liquid yolk is run through a series of sieves, and treated with 2% boric acid. Dried yolk contains no preservative. Details are given with regard to the trade in egg products.

W. H. ADOLPH

**Report of committee on standard methods for the bacteriological examination of shellfish.** P. B. PARSONS, *et al.* *Am. J. Public Health* 12, 574-6 (1922).—Methods for collection of samples, transportation and technical procedure for bacteriol. examn. of oysters in the shell, and opened or shucked stock are given and an arbitrary numerical system is established for the expression of results.

N. V. P.

**Bacteria and molds in dehydrated vegetables.** S. C. PRESCOTT, P. F. NICHOLS AND R. POWERS. *Am. Food J.* 17, No. 6, 11-6(1922).—Dehydrated vegetables under various conditions of storage in diff. types of containers were studied. Bacteria (sol and  $\text{H}_2\text{O}$  types) were present in corn products from several thousand to several hundred thousand and decay mold spores from several hundred to several thousand per g. When  $\text{H}_2\text{O}$  content is under 10% bacteria tend to decrease at 0, 20 and  $37^\circ$  and molds remain nearly const. In humid atm. in containers allowing absorption, molds grow and multiply rapidly. Tin cans with friction tops render perfect protection against  $\text{H}_2\text{O}$  absorption. Paper cartons paraffined and unparaffined were suitable under reasonably dry conditions but not in humid storage; the paraffined paper protected longer.

H. A. LEPPER

**The carbohydrate content of navy beans.** MARIETTA EICHELBERRGER. *J. Am. Chem. Soc.* 44, 1407-8(1922).—By methods very much the same as those used by Peterson and Churchill (*C. A.* 15, 3345) E. several yrs. ago obtained very similar values for the compn. of navy beans, viz. moisture 10.08, ash 3.43,  $\text{Et}_2\text{O}$  ext. 2.36, protein 22.69, alc.-sol. carbohydrate as dextrose (total sugar) 2.61, dextrins 3.23, starch 35.22, insol. hemicelluloses (by difference) 8.90, pentosans 8.08 (included in the insol. hemicelluloses), crude fiber 3.62, org. acids, waxes, etc. (by difference) 7.86.

C. A. R.

**Heat-resistant organisms of cold-packed canned peas.** ANON. *Mich. Agr. Expt. Sta., Tech. Bull.* No. 47, 633-91(1920).—The spoilage in cold-packed canned peas is largely due to the presence of resistant spore-forming organisms which are not killed by the temp. attained in the prescribed method for processing. Results obtained in the chem. analysis of spoiled peas suggest that the detn. of creatinine and  $\text{NH}_3$  may serve to detect bacterial decompn. in this canned-food product.

RUSSELL, M. JONES

**Alcohol-soluble proteins.** Comparison of the ethyl alcohol and methanol-soluble proteins and the action of methanol on digestion. J. R. HESS. *J. Am. Assoc. Cereal Chem.* 7, 56-7(1922).—A table shows the amts. of protein extd. from various flours by  $\text{EtOH}$  and  $\text{MeOH}$ . The  $\text{EtOH}$  used had a sp. gr. of 0.7925 and the  $\text{MeOH}$  0.810. Both were dild. to 70% by vol. In all cases the amt. of protein from the  $\text{MeOH}$  extrn. was greater than that from the  $\text{EtOH}$  extrn., varying from 0.31 to 1.39% more.

D. B. S.

**The determination of moisture in potato flour.** E. H. VOGELZANG. *Chem. Weekblad* 19, 251-2(1922).—All the various methods employed commercially are unsatisfactory and differ from each other as to the results obtained. None of these methods will give the real content of moisture, owing to the colloidal character of the flour. The real moisture can be detd. by employing a current of dry air; however, no definitive method is to be prescribed for this operation.

R. BEUTNER

**Uniform flour.** J. R. HESS AND W. L. RAINEY. *J. Am. Assoc. Cereal Chem.* 7, 65-73(1922).—There are no reasons why different labs. cannot check on  $\text{H}_2\text{O}$ , ash and protein detns. The amts. of total  $\text{H}_2\text{O}$ -sol. and sol. carbohydrates have a marked effect

on making uniform flour; they can be controlled by proper blending. The length of tempering affects the uniformity of flour. The amt. of protein does not seem as important as keeping the relation of total protein to the other constituents. L. O.

**The molds of bread.** W. HERTER AND A. FORNET. *Centr. Bakt. Parasitenk., Abt. II*, 49, 148-75(1919).—Eleven different species of molds were isolated from bread. These molds are harmless for man and animals, but are to be avoided because of the loss of nutritive substances in the bread. Salicylic acid has little or no influence on the growth of mold in bread. JULIAN H. LEWIS

**Biscuit and cake manufacture. II.** WASHINGTON PLATT. *Chem. Age* (N. Y.) 30, 203-6(1922); cf. *C. A.* 16, 1993.—Biscuits, drop cakes, pound cake and sugar wafer tops as affected by the use of milk are discussed. In biscuits the only value derived from use of milk comes from the butter fat present, which can be cheaply and advantageously replaced by the use of an equiv. amt. of butter instead of milk. In drop cakes and pound cakes the butter fat in milk has a value equal to butter fat in an equiv. amt. of butter and the milk has an emulsifying power of great value, which recommends its use in these products. In sugar wafer tops the emulsifying power of milk is essential.

LILLIAN OFFUTT

**Some observations on the sanitary condition of confections.** FRED W. TANNER AND ESTHER DAVIS. *Am. J. Public Health* 12, 606-7(1922).—Bacteria of the colon group were not encountered in 30 samples of candy. Bacteria in candy are in the dormant condition. Spore-forming bacteria predominate. Mold spores were encountered on practically all of the samples. The use of certain volatile oil and allied flavors has much influence in detg. the bacterial count. Cinnamon and peppermint possess decided repressive action. Infected candy will maintain the bacteria in the living condition for a protracted period. Candy is no more of a potential danger in the spread of disease bacteria than many other foods which are eaten in the raw condition. N. V. P.

**The determination of shell in cacao.** CH. ARRAGON. *Mitt. Lebensm. Hyg.* 13, 130(1922).—Chem. analyses of cacao were made to det. the % shell present. Less than 5% shell cannot be detd. absolutely by chem. analyses but more than 10% crude fiber and 5.5% pentosans on the dry and defatted material and a refractive index of the fat greater than 48 at 40° indicates added shell. A table showing the results of chem. analyses of cacaos, germs, shell and various mixt. of these on dry and fat-free basis is given. A microscopical method (use 0.2 g. of dry, defatted cacao, and 5 cc. of antiformin, mix, let stand 15-20 min. until clear yellow, centrifuge, wash once with distd. H<sub>2</sub>O, centrifuge, mix and exam. under microscope) gives more accurate results. Standards of pure cacao contg. known amts. of shell should be used for comparison. L. O.

**The use of synthetic flavors.** ALEXANDER KATZ. *Tea Coffee Trade J.* 43, 122, 124(1922).—Attention is called to the undesirable instability of the lower esters. Occurrence and use of aldehydes, ketones, ethers and lactones in flavors are briefly discussed.

C. W. TRIGG

**Concentrated vanilla compounds.** MELVIN DE GROOTE. *Spice Mill* 45, 1042, 1044, 1046(1922).—The different requirements of vanilla compds. when put to various uses are emphasized.

C. W. TRIGG

**Legal chemistry of salad dressings.** R. O. BROOKS. *Spice Mill* 45, 1222, 1224(1922).—Critical abstract of Lepper's report (*C. A.* 16, 1813). Analyses of 4 salad dressings made by B. are given.

C. W. TRIGG

**Seasoning powder from mushrooms; seasoning extract and pill mass from yeast.** T. SABALITSCHKA AND H. RIESENBERG. *Ber. pharm. Ges.* 32, 48-55(1922); cf. *C. A.* 13, 2941.—A com. mushroom powder was found to contain: H<sub>2</sub>O 9.3, N substances 22.7, fat 2.52, N-free ext. 45.39, crude fiber 13.59 and ash 6.5%. A sample prepd. by the authors contained about 27% N substances, had a strong mushroom-like odor,

rather sharp taste very like pepper, and hence was a pronounced seasoning agent. It was further shown that treatment of the dried mushroom with  $H_2O$  results in soln. of a very considerable % of the N substance, a factor to be considered in blanching and canning operations. Mention is made of a com. yeast ext. (substitute for *Succus Liquiritiae* dep.) and a yeast powder (for *Pulvis Radicis Liquiritiae*), a mixt. of the two finding employment as a pill mass. The yeast ext. (Cenovis) reinforced with that of a seasoning herb mixt. is a dark brown thick viscous mass having a pleasant spicy odor and contg.  $H_2O$  37.6, N substance 18.44, fat 1.58, N-free substance 26.47, ash 15.91, N substance in dry substance 29.55%. W. O. B.

**Kellogg's sampling horn.** J. W. KELLOGG. *J. Ind. Eng. Chem.* 14, 631(1922).—An. app. for sampling feeding stuffs and fertilizers consists of two sections of brass tube which can be joined for use. The new tube overcomes the objectional features of ordinary tubes. D. E. S.

**Digestibility of the sugars, starches, pentosans and proteins of some feeding stuffs.** G. S. FRAPS. Texas Agr. Expt. Sta., *Bull.* 290 (1922).—The total and reducing sugars, starch, pentosans and residual N-free ext. of the N-free extract were detd. and the digestibility of the feeds was calcd. The % compn. of the 3 classes of feeds, viz: non-legume hays, legume hays and starchy concentrates is shown. The % distribution of the constituents and the digestibility data are tabulated. The compn. and digestibility of the feeds are shown by graphs. The amt. of sugars found was low, many of the feeds contg. less than 3%. The roughages contain little and the concentrates contain large amts. of starch. A large % of the sugars and starches is digestible. It is likely that part of the N-free ext. of roughages does not consist of carbohydrates. The legume roughages contain a smaller % of pentosans than the non-legume roughages. The amt. of amides is usually small but sometimes forms a considerable % of the total N. The digestibility of the pentosans in the N-free ext. is more variable and generally lower than that of starch. The digestibility of the residual N-free ext. was lower than that of the pentosans in many samples but with alfalfa hay, peanut hay and other legumes it was over 50%. Some of the samples contained little residual N-free ext. F. C. COOK

**A combination asbestos-wool filter pad for crude-fiber determinations as used for feed analysis in a flour-mill laboratory.** W. L. RAINEY. *J. Am. Assoc. Cereal Chem.* 7, 83-4(1922).—A filter pad in a porcelain Gooch crucible consisting of asbestos on the bottom and glass wool above saved at least an hr. in filtering mill feeds in crude-fiber detns. and gave accurate results. The filter pad should always be thoroughly washed with alkali and acid and ignited before use. DOROTHY B. SCOTT

**Lupines and their use.** K. BRAUER. *Z. angew. Chem.* 35, 192(1922).—Lupines lose a max. of 20% of dry matter during the removal of bitterness. The meal shows  $H_2O$  6.09, N 7.35, crude fiber 18.85, ash 2.56, fat 6.58, carbohydrate 19.98%. It can be used for bread (20% admixt.), as substitute for coffee and as a feeding stuff. H. A. L.

**The judging of the removal of the bitterness of lupines.** ERNST BECKMANN AND FRITZ LÖHMANN. *Chem.-Ztg.* 46, 473-4(1922).—Comparative tests were made between the taste of the wash  $H_2O$  used to remove bitterness from lupines and reactions for alkaloids in the  $H_2O$  by various reagents. The ppt. in the first washings and turbidity in the latter given with KI-I soln. agree well with organoleptic results. This reagent was considered more satisfactory than phosphomolybdic acid, silicotungstic acid and tannin, as reagents for detn. of total residue and  $KMnO_4$  reduction power of the wash  $H_2O$  to judge when harmful alkaloids were removed. To judge when bitterness is removed, treat 5 g. of lupine, cut in pieces (15 g. of moist material) with 50 cc.  $H_2O$  at 50-60° for 20 min., clarify through folded filter. After cooling, add to 1-2 cc. several drops KI-I soln. (1.2 g. I and 3 g. KI per 100 cc.). Lupines with bitterness not removed

give a heavy brown-ppt., with partially removed give a turbidity noticeable against the light. A clear reaction shows that bitterness is entirely removed. Attempt to make the test quant. by titration of excess I in filtrate with  $\text{Na}_2\text{S}_2\text{O}_3$  was unsuccessful.

H. A. LEPPER

**Classification and valuation of meat foods for pigs and poultry.** H. C. S. DE WHALLEY. *J. Soc. Chem. Ind.* 41, 211-3R(1922).—The wide-spread use of meat foods for pigs and poultry seems to call for some sort of classification such as bone meal, meat meal and meat and bone meal. Analyses of the three kinds are given and the detns. such as ash, fat, and albuminoids which det. the class are given. Discussion of the value of each meal follows.

LILLIAN OFFUTT

**Elephant grass.** ANON. *Queensland Agr. J.* 16, 6(1921); *Bull. Imp. Inst.* 19, 518-9(1921).—Analyses show that only very young elephant grass can be classed as a fodder of fair quality and this has only about half the value of couch grass or of prairie grass as a food for cows. As the grass grows older, the food value declines, and becomes very low when maturity is reached. The protein content of the grass is low and inferior to that of sorghum and sugar-cane tops, but about equal to that of maize stalks.

R. L. SIBLEY

**New African feeding stuffs.** ANON. *Bull. Imp. Inst.* 19, 452-7(1921).—*Sesbania cinerascens* seed was analyzed with the following result: moisture 11.4%, crude proteins 21.7%, fat 4.8%, starch 47%, fiber 12.2%, ash 2.9%, food units 113. The seeds contd. no cyanogenetic glucoside but contd. a trace of a substance giving the usual tests for alkaloids. The seed closely resembles "gram" (*Phaseolus mungo*) in compn. Seed of *Crotalaria juncea* (the plant yielding the fiber known as sunn hemp) contd. on analysis: moisture 8.6%, crude proteins 34.6%, true proteins 31.2%, other N substances 3.4%, fat 4.3%, starch 41.1%, fiber 8.1%, ash 3.3%, food units 138. Feeding expts. using  $\frac{1}{4}$  lb. daily for 14 days showed no ill effects, but double that quantity caused general paralysis and ultimately death. Seeds of allied species contd. cytosine and although no cyanogenetic glucosides were present, a substance giving reactions similar to those of alkaloids was found. *Schotia* seeds, after removal of the arils were examd. with the result: moisture 8.6%, crude proteins 9.8% (true proteins 8.6%, other N substances 1.2%), fat 2.6%, carbohydrates 68.2%, fiber 8.7%, ash 2.1%, food units 99. Seeds assume a dark unattractive color when boiled. Arils yielded 24% and the seeds 5.4% of matter extd. by  $\text{Me}_2\text{CO}$  but it was not a true resin. R. L. S.

Bactericidal action of pyromucic acid (KAUFMANN) 11C.

**Edible oleaginous product (substitute for lard or butter).** C. ELLIS. U. S. 1,417,893, May 30. A mixt. of the consistency of lard or butter is formed from medicinal petroleum oil, hydrogenated oil, butyric glyceride and  $\text{H}_2\text{O}$ . Cf. C. A. 16, 301.

**Apparatus for preparing margarine.** H. BORGES and G. W. WADSWORTH. U. S. 1,418,357, June 6. Margarine is prepd. from an emulsion of liquid ingredients by a beating and kneading operation within a jacketed app.

**Apparatus for drying foods.** E. M. FRANKEL and K. G. FALK. U. S. 1,418,638, June 6. The app. is especially adapted for treating meat with drying and preservative gases and vapors.

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**Development of the chemical industry in the last hundred years.** F. W. FREDRICH. *Trans. Acad. Sci. St. Louis* 24, No. 6, 16 pp.(1922). E. H.

**Industrial research.** ANON. *Electrician* 88, 450(1922).—A short report on the activities of the Brit. Elec. & Allied Industries Research Assoc. Brief comments are included on micas, synthetic resins, insulating oils, turbine blades, etc. C. G. F.

**The future of industrial research.** F. PRAKE SEXTON. *Electrician* 88, 627(1922).—A general discussion. "The personnel of the laboratory is the most important item." C. G. F.

**The place of scientific research in the programs of trade associations.** E. R. WEIDLEIN. *Chem. Age* (N. Y.) 30, 241-3(1922). E. H.

**The teaching of applied chemistry at Massachusetts Institute of Technology.** ANDRÉ DESCHAMPS. *Bull. soc. chim. Belg.* 30, 129-34(1921). WM. STERICKER

**Technology at the German universities.** H. WICHELHAUS. *Z. angew. Chem.* 35, 280-1(1922). E. H.

**An informational service for a chemical manufacturing concern.** D. B. KEVES. *Chem. Met. Eng.* 27, 54-8(1922). E. H.

**Chemists and the patent laws.** HORATIO BAILLANTYNE. *J. Soc. Chem. Ind.* 41, 121-2R(1922). E. H.

**Industrial applications of the colloid mill.** S. P. SCHOTZ. *Chem. Age* (London) 6, 790-2(1922).—The applications discussed are in the industries of perfumes and flavoring essences, homogenized milk, lubricants and viscose. E. H.

**Expansion and contraction of solutions and their quantitative and thermal effects during the concentration of solutions and distillation of mixtures.** HUGO SCHRÖDER. *Chem. App.* 9, 85-8, 97-102(1922).—A general discussion with 10 charts showing the change in vol. of solns. with increasing strength, and with formulas for calcg. the amt. of  $H_2O$  evapd. in raising solns. from a lower to a higher sp. gr. J. H. MOORE

**The art of distillation.** OMEGA. *Chem. Trade J.* 70, 775-8(1922).—A review. E. H.

**Apparatus for artificial draft in chemical work.** ERNST BLAU. *Chem.-Zig.* 45, 597-9(1921).—Takes up the means of producing draft or ventilation in chem. works and also draft for boilers. The direct, indirect and suction systems are described with reference to German practice. Illustrated. P. D. V. MANNING

**Measuring steam by means of a chemical method.** J. RUTTEN. *Chem. Weekblad* 19, 229(1922).—The problem in question is to find out how much of the total steam produced by a boiler is used up in the various departments of a factory (or rooms of a house). The total quantity of steam is mixed with a definite, known, small quantity of  $NH_4$ , which is taken out in the branch pipelines and detd. by means of Nessler reagent. Thus the quantity of steam used up in any of the branches can be calcd. R. BEUTNER

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Heat transmission (HOWE, PHELPS) 19.

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HAMMES, J.: *Scheikunde voor den Technicus*. Amsterdam: N. V. Wed. J. Ahrend & Son. fl. 7.20. Reviewed in *Arch. Suikerind.* 30, 244(1922).

LEITNER, FRIEDRICH: *Die Selbstkostenberechnung industrieller Betriebe*. 7th ed. Frankfurt: J. D. Sauerländer. M 60, bound 65. Reviewed in *Z. Ver. deut. Zuckerind.* 72, 295.

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**Evaporating liquids.** E. MORTERUD. U. S. 1,418,197, May 30. Vapor from liquid undergoing evapn. is compressed and the heat of condensation from the com-



pression is transmitted by contact with a material insol. in the condensate such as Hg or heavy oil and the heat thus absorbed is utilized for assisting in the evapn.

**Recovering volatile solvents.** G. W. COGGESHALL and T. M. RECTOR. U. S. 1,418,363, June 6. Condensable volatile solvents such as alc. which have been adsorbed on activated C or other solid materials are driven off by subsequent heating in a current of incondensable gas which is cyclicly circulated through the adsorber and a condenser where the condensable solvent is recovered.

**Recovering aqueous and other vapors.** O. MAASS. U. S. 1,417,618, May 30. Vapors such as those which are evolved in concg. milk or  $H_2O_2$  solns. are passed into an absorption app. where they come into contact with an absorbing liquid such as  $H_2SO_4$ , which is caused periodically to rise and fall to wet the wall of the app.

**Freeing gases from catalyst poisons.** J. C. W. FRAZER, A. B. LAMB and D. R. MERRILL. U. S. 1,418,246, May 30. Readily oxidizable catalytic poisons such as CO, arsine and phosphine are removed from H or other gases by subjecting the gases to the action of catalysts such as Cu oxide or Cu and Mn at temps. of 50–110°.

**Electrical insulation.** R. E. OTTMAN. U. S. 1,418,730, June 6. A non-conducting fabric such as paper or cardboard is impregnated with a soln. of borax and  $NH_4$  phosphate, dried and then coated with a mixt. of  $CaCO_3$ , ZnO and linseed oil.

#### 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

**Investigation by means of the hydrogen electrode of the chemical reactions involved in water purification.** R. E. GREENFIELD AND A. M. BUSWELL. *J. Am. Chem. Soc.* **44**, 1435–42(1922).—Titration of carbonates with a strong acid showed that the metal ions had no effect but the inflection point occurs in the titration curve at a slightly higher Sørensen value in dil. solns. than in more concd. ones. The pptn. of Mg as  $Mg(OH)_2$  was complete at a  $p_H$  of about 10.6, while the pptn. of  $CaCO_3$  was complete at a  $p_H$  9.5.  $Al(OH)_3$  starts pptg. at  $p_H$  4 and is completely pptd. at  $p_H$  6.5–7.5, while resohn. was complete at a value of  $p_H$  between 10 and 11. Pptn. took several hrs. for completion, especially with the more dil. solns.

G. C. BAKER

**Study and report on specifications for various chemicals used in water treatment.** ANON. *Am. Railway Eng. Assoc. Bull.* **243**, 498(1921); *Railway Age* **72**, 689(1922).—Specifications for soda ash, hydrated lime, quicklime,  $Al_2(SO_4)_3$ , and  $FeSO_4$  were adopted.

R. C. B.

**Largest storage reservoirs in the United States in use in 1920.** ALLEN HAZEN. *Eng. News-Record* **88**, 799(1922).—A list of reservoirs with capacities.

FRANK BACHMANN

**Indianapolis' ten-million-gallon covered reservoir.** W. C. MABER. *Eng. News-Record* **88**, 739–40(1922).

FRANK BACHMANN

**Experiments upon the autoupurification of water held in large reservoirs and exposed to the direct action of the sunlight.** P. C. FLU. *Geneesk. Tijdschr. v. Nederlandsch. Indie* **61**, 294(1921); *Bull. intern. office d'hyg. pub.* **14**, 593(May 1922).—Expts. were carried out in 35-l. basins and in an 80-m.<sup>3</sup> reservoir. Holding water for 8 days will usually render it inoffensive so that it may safely be filtered without close bacteriol. supervision.

JACK J. HENMAN, JR.

**Operation and tuning up of the Cleveland filters.** J. W. ELLMS. *Eng. News-Record* **88**, 776–9(1922).—Operating and analytical data are given.

FRANK BACHMANN

**Study of progress of regulations of Federal or State health authorities pertaining**

to drinking-water supplies. ANON. *Am. Railway Eng. Assoc. Bull.* 242, 487(1921); *Railway Age* 72, 689(1922).—Review of recent regulations by Public Health Dept. relative to railway drinking-water supplies.

R. C. BARDWELL

University work of interest to railway water supply. *Am. Railway Eng. Assoc. Bull.* 243, 527(1921); *Railway Age* 72, 689(1922).—Investigations recently completed or under way at Purdue Univ., Univ. of Iowa, Univ. of Montana, Univ. of Manitoba, and Sheffield Scientific School are mentioned.

R. C. BARDWELL

The corrosion of metal water conduits. HUGO KÖHL. *Gas-u. Wasserfach* 65, 99-102(1922).—K. reviews the literature with regard to the corrosion of Pb, Cu, cast-Fe, Zn, and various alloyed metallic conduits. Preventive measures are given.

MARTIN E. FLÉNTJE

The interior treatment of boiler waters. C. R. KNOWLES. *Railway Age* 71, 935.—It is estd. that 50% of the boiler water used on Am. railroads is of such quality that treatment would show economy in locomotive operation and of this amt. only 6% is being treated by exterior method. Construction of treating plants for the remaining 94% will take yrs., and interior treatment is recommended in the meantime. The following articles contain comments on K.'s article. Use of boiler compounds. L. F. WILSON. *Ibid* 1077(1921).—Interior treatment is recommended. Boiler compound and anti-foaming compounds. W. H. HOBBS. *Ibid* 1132.—The difference between anti-scale and anti-foam compounds is emphasized. Interior boiler treatment as an alternative. R. C. BARDWELL. *Ibid* 1184.—Careful check of water quality is recommended. The interior treatment of boiler waters. C. H. KOVL. *Ibid* 1241.—Foaming is caused by sludge and suspended matter. An instance is cited where a water contg. 1000 gr. per gal. initial Na salt concn. is used successfully. External treatment is advocated where water contains over 12 gr. per gal. incrustants. A difference of opinion on water treatment. W. H. GREEN. *Ibid* 72, 313-4(1922).—Excessive agitation is harmful. Filtration is beneficial to remove the foaming tendencies caused by suspended matter. Improvement and control of boiler waters. W. M. BARR. *Ibid* 364.—The Union Pacific Ry. uses 75% of all anti-foaming compds. in a district which has no softening plants. Careful check of water quality is recommended. An advocate of soda ash. R. W. CHORLEY. *Ibid* 412.—Where incrusting solids are not high, treatment of water in wayside tanks is recommended. Treated water improves locomotive performance. W. A. POWNALL. *Ibid* 794.—A full review of soda ash treatment on the Wabash Ry. Tests show that excess soda ash treatment and proper blowing off will (1) keep heating surfaces comparatively free from scale, (2) cause the scale-forming solids to be deposited as soft sludge, (3) practically eliminate engine failures due to leaky flues, fireboxes, etc., (4) reduce staybolt breakage and fire box renewals, (5) decrease cost of boiler repairs, and (6) increase mileage between washouts. The boiler compound. D. K. FRENCH. *Ibid* 907-8.—Quotations from several articles are given favoring use of boiler compds.

R. C. BARDWELL

Boiler cleaners for municipal power plants. W. J. SCHAPHORST. *Am. City* 26, 491(1922); *Pub. Health Eng. Abstracts* July 8, 1922.—Mechanical methods of removing scale and soot by rotary cutters or vibratory removers are recommended. Boiler compds. are warned against, especially those having secret formulas. C. C. BAKER

Central water supplies for settlements. NEUBER. *Zentralblatt Bauverwaltung* 213(Apr. 29, 1922); *Water and Water Eng.* 24, 186(1922).—Costs of various plans for towns of less than 10,000 are compared.

JACK J. HINMAN, JR.

The purification of swimming pools by means of chlorine. ANON. *Bull. hyg. balnéaire propraté* 9, 18(1921); *Bull. intern. office hyg. publ.* 14, 582(May 1922).—Reviews the regulations of the State Boards of Health of Calif. and Florida, and discusses the use of chlorinators in treating the water.

JACK J. HINMAN, JR.

Missouri Pacific continues to show large savings from water treatment. ANON. *Railway Age* 72, 1188(1922).—Mo. Pac. Ry treated 1,781,560,000 gal. in 1921 removing 4,916,247 lbs. scaling solids at a total expense of \$170,575. Plants softened 34.6% of water used. Coal saved was 62,000 tons. R. C. B.

Operation control panels for the Sacramento filters. ANON. *Eng. News-Record* 88, 782-4(1922).—Unique features of control are: upright panels; valve-opening indicators of colored liquids in glass tubes; loss-of-head gages; rate-of-filtration gages are air gages; and the wash-water rate is indicated directly from a Pitot tube in the wash water line. FRANK BACHMANN

Chester (England) water works: past and present. FREDERICK STORR AND C. W. BENNETT. *Water and Water Eng.* 24, 193(1922).—An historical account tracing the development from Roman times. The plant depends upon slow sand filters, but pressure filters were contracted for in 1921. JACK J. HINMAN, JR.

The destruction of mosquito larvae in salt or brackish water. JOHN F. MARSHALL. *Nature* 109, 746-7(1922).—A liquid contg. 15% of sol. cresol will kill the larvae of the salt-water mosquito, *Ochlerotatus detritus*, in 1 hr. when added to the water at a diln. of 1 in 16,000. W. H. ROSS

Carbon dioxide, odor and iron at Virginia Beach, Va. RICHARD MEISSER, A. WAGNER AND LINN H. ENSLOW. *Eng. News-Record* 88, 774-5(1922).—The raw water is taken from 31 driven wells, 2" diam. and 20' deep. The water is highly colored and has a noticeable odor. Treatment consists of: aeration through nozzles; CaO and Ca(OCl)<sub>2</sub> treatment followed by sedimentation; filtration through sand; and storage in a covered reservoir. The Cl aids in removal of color and odor. The main object of CaO is complete removal of CO<sub>2</sub> and formation of a "blanket" on the filter. The installation has replaced cisterns as laundry supplies and bottle water for table use. FRANK BACHMANN

Bacteria fermenting lactose, and their significance in water analysis. MAX LEVINE. Eng. Expt. Station, Iowa State College, *Bull.* No. 62, 127(1921).—A complete review of knowledge of the colon group of bacteria, and their relation to water supply. Details of the technic, prepn. of media, and a bibliography of 205 titles are given. An unusual feature is the chapter devoted to the spore-forming lactose-fermenters. JACK J. HINMAN, JR.

Effect of local deposits on pollution of surface and shallow well water supplies. ANON. *Am. Railway Eng. Assoc. Bull.* 243, 600(1921); *Railway Age* 72, 689(1922).—Typical instances of pollution are given. R. C. BARDWELL

The destruction of tubercle bacilli in sewage by chlorine. JOHN M. CONROY, BERNICE BRASTED CONROY AND ARTHUR T. LAIRD. *Am. Rev. Tuberculosis* 6, 63-8 (1922).—Sewage from a tuberculosis sanatorium nearly always contains living tubercle bacilli. Cl is a practical means of ridding such sewage of bacilli. Preliminary treatment of the sewage is necessary to reduce it to liquid form. H. J. CORPER

Experiments on the vitality of cholera vibriones and typhoid bacilli in sea water. P. C. FLU. *Med. Burgerlijken Geneeskundigen Dienst in Nederlandsch-Indië* No. 3, 317(1921); *Bull. intern. office d'hyg. pub.* 14, 563(1922).—In sea water artificially contaminated, the cholera vibriones survived 4 or 5 days, as did the typhoid bacilli in one expt. Similar results were obtained with the cholera vibriones and river water. JACK J. HINMAN, JR.

Experiments on the longevity of the *Vibrio cholerae* and *Bacillus typhosus* in septic tanks at Batavia. P. C. FLU. *Med. Burgerlijken Geneeskundigen Dienst in Nederlandsch-Indië* No. 3, 289(1921); *Bull. intern. office d'hyg. pub.* 14, 564(1922).—F. tried to recover *B. typhosus* from the effluents of septic tanks by pptn. by FeSO<sub>4</sub> and Na<sub>2</sub>CO<sub>3</sub>. No positive results were obtained except in artificially seeded tanks. The

survival of the organisms did not exceed 24 hrs. for *V. cholerae* nor 2 to 3 days for *B. typhosus*.

JACK J. HINMAN, JR.

**Operation of sewage-treatment plants.** Rules prescribed by Iowa State Board of Health, March, 1922. 32 pp. *Pub. Health Eng. Abstrs.* July 8, 1922.—Three to 11 rules are given for things to watch in grit chambers, septic tank, Imhoff tank, dosing or siphon chamber, sand filters, contact filters, trickling filters, secondary settling tanks and sludge beds. Purposes and limitations of rules are given.

G. C. BAKER

**The selection of sewage-purification systems.** H. MERTZGER. *Kommunal-u. Staatsbedarf* 43, I-II (Jan. 1922); *Gesundh. Ing.* 45, 288(1922).—M. explains the necessity of sewage purification, and discusses the various methods available for this purpose.

MARTIN E. FLENTJE

**Relation of iron to activated sludge.** GEO. H. W. LUCAS. *Can. Chem. Met.* 6, 131-4(1922).—Iron plays an important role in the activated-sludge process. The difference in Fe content explains the difference in color (Worcester reddish brown), flocking and settling of various sludges. The flocculating action of the Fe salts is largely chem. and is due to the formation of  $\text{Fe(OH)}_3$ , while the effluent is stable for a longer time than the ordinary activated-sludge effluent. The percentage of Fe apparently increases the total N in the sludge, and Fe pipes are readily oxidized by the alk. sewage in the presence of O.

G. C. BAKER

**The use of sewage in Bremen.** MÜLLER. *Deutsche Bauzeitung* No. 92, 406-68 (1922); cf. *Gesundh. Ing.* 45, 260(1922).—During the summer months Bremen sewage is pumped into the Weser river, while during the winter it is pumped over nearby fields after dild. with river water to about  $1\frac{1}{2}$  times its original vol. The floating material is removed in summer by rough screens and Riensch disks, in winter by the rough screens only. The sewage contains  $\text{H}_3\text{PO}_4$ , 0.0251, K 0.0578, and N 0.0437 g. per l.

MARTIN E. FLENTJE

**The biological purification of household waste waters.** G. GIANOLI. *Industria* 25, 388-9(1921); *Chimie et industrie* 7, 915(1922).—G. discusses the failure of small-sized biological purification plants. He studied the waste water from a group of working-men's houses as it came from the cesspool. The vol. of water to be purified should not exceed 25 l. per 24 hrs. per m.<sup>2</sup> of filtering surface, as these waters contain 293 mg.  $\text{NH}_3$  per l. as compared with 30-50 for sewage from large installations which is very highly dild. The degree of purification obtainable is of importance. Even with modern and well operated equipment, biological purification does not completely eliminate pathogenic bacteria. In the case of epidemics additional measures should be taken, and more particular chem. purification methods should be used. Too much reliance should not be placed on  $\text{O}_3$  or on X-rays. Household waste waters cannot be completely sterilized and should not be used for other purposes than for irrigation, as the content of inorg. matter is not decreased and they contain a large amt. of nitrates, which renders them unfit for watering livestock. Biological purification renders the water absolutely inodorous after it has been dild. to a certain extent, allowing, in certain cases, of its elimination in open ditches, or of using it for the irrigation of gardens or orchards.

A. P.-C.

**City ordinances governing the removal of garbage in Zwickau.** ANON. *Stadtereinigung* 14, 19-21 (Feb. 1922); *Gesundh. Ing.* 45, 288(1922).—City ordinances governing the removal of household garbage and night soil in Zwickau are given.

M. E. F.

**Anti-gas measures in sewers and sewage tanks.** H. C. WHITEHEAD. *The Surveyor* 60, 293-4; *Eng. Contr.* 57, 302(1922).—Tests for toxic gases should be made before sewers or sewage tanks are entered.  $\text{H}_2\text{S}$  can be detected by  $\text{Pb(OAc)}_2$  paper. Inflammable gases are indicated by heating of the wire screen of a miner's safety lamp. If the light is extinguished in less than two minutes lack of oxygen is indicated. A simple test for CO is desirable.

F. W. MOHLMAN

Siwa oasis (FORBES) 15.

**Purifying water.** M. F. NEWMAN. U. S. 1,418,013, May 30. Water is clarified and freed from color due to soil acids, vegetable exts. and similar substances by treating with an alkali and a bleaching agent such as  $\text{Ca}(\text{OH})_2$  or  $\text{Na}_2\text{CO}_3$  and Cl or a hypochlorite and then treating with a coagulant such as  $\text{Al}_2(\text{SO}_4)_3$  and with a reagent, such as  $\text{Na}_2\text{S}_2\text{O}_4$ , which removes any excess of the bleaching agent.

**Apparatus for controlling the supply of water-purifying chemicals.** W. J. DANAHY. U. S. 1,418,289, June 6.

**Furnace and retort for distilling garbage and similar materials.** P. L. GOODMAN. U. S. 1,419,135, June 13. Material in retorts is first distd. to recover volatilized condensable products and the carbonized residue is then dumped into the combustion chamber of the retort furnace by inverting the retort.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**Further studies on the nature of nitrification.** KOJI MIYAKE AND S. SOMA. *J. Biochem. (Japan)* 1, 123-9(1922).—Nitrification as a whole is an auto-catalytic monomol. chem. reaction and increase of  $\text{HNO}_3$  is in accordance with the formula:  $\log x - \log (A - x) = K(t - t_0)$ . The decrease of ammonia compds. from the soil is also an auto-catalytic reaction following the formula:  $\log (A - x)/\log (x - a) = (A - a)Kt - K_1$ , where  $x = \text{N as } \text{NH}_3$  at the end of time  $t$ , and  $A$  and  $a$  denote the original and final amt. of  $\text{NH}_3$ .  $K$  and  $K_1$  are consts. S. MORGULIS

**The physico-chemical problems relating to the soil—A general survey.** E. J. RUSSELL. *Trans. Faraday Soc.* 17, 219-23(1922).—A discussion of soil problems, treating of the mineral particles of the soil, the org. matter, the soil soln. and soil colloids.

WILLIAM HAZEN

**The mechanism of flocculation in soils.** N. M. COMBER. *Trans. Faraday Soc.* 17, 349-53(1922).—The flocculation of soil particles appears to fall fairly well into line with the flocculation of suspensoid sols, and to be amenable to the isoelec. point theory. The flocculation of clay by lime, however, is not compatible with the elec. theory, and must be explained as a case of abnormal flocculation in which the flocculent reacts with the protecting emulsoid matter, such as colloidal silica. This accounts for the fact that alky. facilitates the flocculation since the formation of the ppt. is dependent upon the alky. Cf. *C. A.* 15, 2324.

WILLIAM HAZEN

**The vertical distribution of soil acidity in natural soils and its relation to the organic constituents.** E. J. SALISBURY. *Trans. Faraday Soc.* 17, 295-304(1922).—S. discusses the factors, such as carbonated rain water, which bring about the removal of bases from a soil and also the reverse factors, such as the living mantle of plants, which exert a pumping action on the soil and bring the bases up to the surface. Generally the acidity of a soil decreases with the depth of the soil.

WILLIAM HAZEN

**A simple and quick method for approximate determination of the acidity of a soil.** D. J. HISSINK. *Chem. Weekblad* 19, 281-3(1922).—The method of Comber (*C. A.* 15, 2326) is improved. Comber det. the  $p_H$  of a soil by means of a 4% soln. of KSCN in 95% alc. If 2 g. of the soil are shaken with 5 cc. of this soln. a dark red color indicates a "very sour" soil ( $p_H = 4$  to 5) or a light red color indicates a "slightly sour" reaction ( $p_H = 5$  to 6). If the soln. remains colorless the soil may be either neutral or alk. In order to give a more accurate discrimination in the latter case H. adds  $\text{FeCl}_3$  to the soln. of Comber, thus producing a red color before shaking with the soil. If

the soil is alk. it will decolorize this soln.; if it is neutral it will not. The method of Comber was standardized by means of potentiometric measurements and found to be correct.

R. BRUTNER

**The formation of alkali soils.** ALBERT HOWARD AND G. L. HOWARD. Agr. Research Inst. Pusa, *Bull.* 119, 10-13(1921).—The essential condition for the production of alkali soils is defective soil aeration, the first result of which is a reductive phase, often accompanied by the formation of the bluish green Fe compds. so characteristic of ill drained soils. Subsequent oxidation results in the formation of white alkali.

H. W. EASTERWOOD

**Note on the hygroscopicity of clay and the quantity of water adsorbed per surface unit.** SVEN ODÉN. *Trans. Faraday Soc.* 17, 244-8(1922).—Curves are given showing the relation between water adsorbed by a clay soil and the changing pressure of water vapor in the atm. in which the expt. is conducted. A formula is given by means of which the surface area of each particle of clay can be detd., also the surface area per g. of clay.

WILLIAM HAZEN

**The chemical composition of the soils of the Belvidere area in New Jersey.** A. W. BLAIR AND H. C. MCLEAN. New Jersey Agr. Expt. Sta., *Bull.* 362, 16 pp.(1922).—Twenty-three soil series including 33 soil types are represented in the chem. study of the Belvidere area, which are derived largely from the underlying cryst. and sedimentary rocks. Certain of the series have been materially influenced by glacial action. There is a striking similarity in chem. compn. of the different soils of this area. In the majority of surface samples the N ranges between 0.09 and 0.14%; the  $P_2O_5$  is about the same; the K is near 2% or more; the Ca varies from about 0.20 to 0.50%; Mg, from about 0.75 to 2% or over; and the total C, between 1 and 2%. With one exception the N and C are higher in the surface soil than in the subsoil. The Hagerstown loam shows over 3 1/3% of K in the top soil, and the silt loam nearly 6% in the top soil and over 6% in the subsoil. About half the soils of the area may be put in the class of those requiring some lime treatment. Of the so-called "acid soils," the majority have a lime requirement ranging from about 800 to 1600 lbs. per acre.

J. J. SKINNER

**The chemical composition of the soils of the Millville area in New Jersey.** A. W. BLAIR AND H. C. MCLEAN. New Jersey Agr. Expt. Sta., *Bull.* 366, 15 pp.(1922).—Sixty-six samples representing 5 soil series and tidal marsh and muck are represented in the chem. study of the soils of the Millville area. The majority of these were taken from the Sassafras series. These soils are principally of marine origin and have been derived largely from unconsolidated sands and gravels. With comparatively few exceptions these soils are all low in total plant food content when compared with the av. soils of the state. For the Sassafras, Norfolk and Lakewood sands the N in the surface soil is usually less than 0.05%; for the Portsmouth and Scranton series it is double this amt. or more, because of the higher percentage of org. matter.  $P_2O_5$  is low in nearly all, and K in all except Tidal Marsh and one sample of Portsmouth sand. Ca and Mg are low in all samples that were analyzed except the samples of Tidal Marsh. There is a higher percentage of N in the surface soil than in the subsoil. The majority of these soils show a high lime requirement.

J. J. SKINNER

**Siwa Oasis.** R. H. FORBES. *Cairo Sci. J.* 10, 1-8(1921).—Analyses of soil and of water are given.

F. H.

**The nitrification of stable manure in cultivated soil.** C. BARTHEL. *Centr. Bakt. Parasitenk., Abt. II* 49, 382-92(1919).—Expts. with cultivated soils of different reaction are reported, which showed that under conditions especially favorable for nitrate formation, during 4 or 5 mos., the nitrate N formed corresponded only to a greater or less part but not to the total of the  $NH_3$  N available in the solid manure. The action

of the N of the solid manure in the first cropping season is ascribed mainly to its content of  $\text{NH}_4\text{N}$ . This content cannot be considered to indicate the value of stable manure as a nitrogenous fertilizer, since not all the  $\text{NH}_4\text{N}$  is transformed into nitrate, and since the residual effect of the manure is to be ascribed to other N compds. In the same series of expts., the amt. of nitrate N formed from the  $\text{NH}_4\text{N}$  of the manure was const. and was independent of added amts. of manure. In cultivated soils in good tilth, but with a distinct acid reaction, nitrate formation was as powerful as in neutral soils. The previous findings of other experimenters, that the nitrification of N in  $(\text{NH}_4)_2\text{SO}_4$  is much poorer in acid soils than that of org. N, was confirmed by these expts. This relation is explained on the basis of the H-ion concn. which occurs when  $(\text{NH}_4)_2\text{SO}_4$  is decompd. in acid soils.

JULIAN H. LEWIS

**Phosphatic fertilizers.** E. J. RUSSELL. *J. Ministry Agr.* 29, 234-40 (1922).—A review and discussion of the compn., properties, and applications of the various types of phosphate fertilizers.

P. R. DAWSON

**Penguin guano from the Falkland Islands.** ANON. *Bull. Imp. Inst.* 19, 463-5 (1921).—Samples of guano taken at depths from 1 to 4 ft. in deposits showed on analysis 49.38-80.09% moisture, 7.25 to 41.64% additional loss on ignition, 1.70 to 43.37% ash. Chemical analyses were as follows: CaO 0.13 to 1.21%, MgO 0.11 to 0.55%,  $\text{P}_2\text{O}_5$  0.09 to 1.74%, N 0.434 to 1.03% consisting of org. N 0.429-0.82%,  $\text{NH}_4$  salts 0.04 to 0.19%, nitrates 0.004 to 0.07%. The brown aqueous liquid percolating through the deposit contd. 0.66% total solids, consisting largely of sol. phosphates. Present samples are very inferior to good Peruvian guanos in respect to amts. of N and  $\text{P}_2\text{O}_5$  present. Inferiority is probably due to prolonged leaching by rain water.

R. L. S.

**Water hyacinth ash as a fertilizer and source of potash.** ANON. *Bull. Imp. Inst.* 19, 460-2 (1921).—The water hyacinth (*Eichornia crassipes*) grown in Burma, gave a dark brown ash when burned. About 11% of the crude ash was sol. in  $\text{H}_2\text{O}$ , the soln. having an alk. reaction. The  $\text{H}_2\text{O}$ -sol. portion had the compn.  $\text{K}_2\text{O}$  4.76%,  $\text{Na}_2\text{O}$  1.22%, CaO 0.26%, MgO 0.23%, Cl 3.91%,  $\text{SO}_4$  0.88%. The portion insol. in  $\text{H}_2\text{O}$  yielded:  $\text{K}_2\text{O}$  1.51%,  $\text{Na}_2\text{O}$  0.66%, CaO 4.49%, MgO 2.29%,  $\text{P}_2\text{O}_5$  4.17%, residue 50.36%. The amt. of  $\text{K}_2\text{O}$  varies largely with the conditions under which the plant grows. It would be necessary to ext. about 14 tons of ash to obtain a ton of 80% KCl.

R. L. SIBLEY

**Influence of fertilizer on the yield, size and quality of pecans.** J. J. SKINNER. *Proc. Ga.-Fla. Pecan Growers Assoc.* 1922, 50-56.—By 4-year expts. with pecans on 3 soil types and with several varieties it is shown that fertilizers have an influence on the yield, size and quality of the nuts. The largest increased yield was obtained with a complete fertilizer contg. a high % of N. N had a marked influence on the size and filling quality of the nut. The protein content of the pecan kernel was highest where high N fertilizers were used. K had a tendency to produce a kernel, with increased oil content and a clearer and lighter colored meat. Fertilizer mixts. for pecans are suggested. Cf. *C. A.* 15, 3174.

J. J. SKINNER

**Ammonium chloride and other nitrogenous fertilizers.** L. MAUME. *Prog. agr.* vii, 77, 588-92 (1922).—Field expts. were conducted with wheat to compare, under identical conditions, the effect of  $\text{NH}_4\text{Cl}$ , Ca cyanamide,  $\text{NaNO}_3$ ,  $\text{Ca}(\text{NO}_3)_2$ ,  $\text{NH}_4\text{NO}_3$  and  $(\text{NH}_4)_2\text{SO}_4$  in concns. corresponding to 60 kg. of N per hectare. In one set the fertilizer salt was applied 10 days before planting; in another the application was simultaneous with planting. In both cases  $\text{NH}_4\text{Cl}$  gave results, as measured by yields of grain alone as well as grain plus straw, which compared very favorably with  $\text{Ca}(\text{NO}_3)_2$ ,  $\text{NH}_4\text{NO}_3$  and  $(\text{NH}_4)_2\text{SO}_4$  being surpassed by  $\text{NaNO}_3$  alone.

P. R. DAWSON

**Green manuring.** H. J. PAGE. *J. Ministry Agr.* 29, 240-8 (1922).—A discussion

of the mode of action, application, and other factors involved in the use of green manures. P. R. D.

**Fertilizing experiments with the nettle (*Urtica dioica*) in low moors.** G. BREDEMANN. *Faserforschung* 1, 26-32(1921).—A study of the effect of different forms of K and of the various constituents of fertilizers upon the growth and yield of nettle fiber. With an unfertilized patch as 100, the figure for a complete fertilizer ( $P_2O_5$ ,  $K_2O$ , N,  $CaO$ ) was 108, without  $K_2O$ , 122, without  $H_3PO_4$ , 89, and without N 116. The work is being extended. C. J. WESS

**The third report of the state experiment orchard, Berri, River Murray.** G. QUINN AND C. G. SAVAGE. *J. Dept. Agr. S. Australia* 25, 680-99(1922).—Various subjects are covered in this report. Fertilizer tests with peach, apricot and orange trees are reported with wts. of fresh and dry fruit for 1920 and 1921, also acre av. for 3 yrs. Tests in sulfurizing apricots, peaches and nectarines are reported. No analyses of the fruit are given. F. C. COOK

**Manuring lucerne crops.** A. J. PERKINS. *J. Dept. Agr. S. Australia* 25, 779-81(1922).—Heavy cuts of lucerne require an adequate supply of org. matter, plenty of available  $CaO$ , K and phosphates. F. C. COOK

**Spreading and adherence of arsenical sprays.** WM. MOORE. Minnesota Agr. Expt. Sta., *Tech. Bull.* 2, 50 pp.(1921).—Org. compds. as beechwood creosote, carvacrol, or amyl alc., sol. in fats and but slightly sol. in  $H_2O$ , produce good spreading over waxy leaves such as cabbages, while proteins and plant infusions give good spreading on leaves with surface of cellulose such as plum and citrus leaves. Electrically positive As preps. adhere more strongly to the leaf surface than do those which are negatively charged. The compds. of As such as Pb arsenate, Paris green and Ca arsenate, have particles carrying negative elec. charges. Arsenic compds. of Al, Cr, and Fe may be prepd. so that the particles carry a positive charge. Ferric arsenate appears the most promising and is more toxic than Pb arsenate.  $Fe_2O_3$  or  $Fe(OH)_3$ , by adsorbing compds. of As, lowers their toxicity to insects. J. J. SKINNER

**Cupric powders and mildew.** LUCIEN SEMICHON. *Rev. vit.* 56, 310-5(1922).—A discussion of the comparative advantages of Cu sprays and powders with emphasis upon the particular properties of the latter and the precautions necessary in the use thereof. P. R. DAWSON

**Copper and mildew.** G. VILLEDIEU. *Rev. vit.* 56, 406-9(1922); cf. *C. A.* 16, 983, 2194.—A further discussion of V.'s theory that  $CaSO_4$  is the active principle in Bordeaux mixt. The greater efficacy of sprays prepd. with  $CuSO_4$  as compared with those contg. Fe or Al is explained by the increased soly. of  $CaSO_4$  in the presence of Cu salts as compared with Fe or Al. P. R. DAWSON

**The apple root borer.** J. B. HARRIS. *J. Dept. Agr. S. Australia* 25, 706-7(1922).—It is recommended that a Zn collar be placed around the trunk of the tree to prevent insects ascending to lay their eggs. The mature beetles and newly hatched larvae may be destroyed by spraying with a strong soln. of lead arsenate. F. C. COOK

**Blowflies and sheep.** F. E. PLACE. *J. Dept. Agr. S. Australia* 25, 700-5(1922).—A general discussion of the problem.  $HgCl_2$  solns., As dip, also  $CuSO_4$  solns. are mentioned as larvicides and of value in drying the wounds of sheep. F. C. COOK

**Kellogg's sampling horn (KELLOGG) 12.** Detection and determination of nitrate nitrogen in the urine and in liquid manure (NOLTE) 11B.

**Freeing nitrogen fertilizer compounds from acid.** C. A. BUTT. U. S. 1,418,618, June 6. Nascent H is generated in fertilizer materials such as nitrate mixts. by reaction of Fe on acid present in order to produce  $NH_3$  in the material and neutralize any acidity.



**Arsenical insecticide.** W. H. SWENARTON. U. S. 1,418,848, June 6. Pb arsenate is prepd. by a cyclic method in which an aq. soln. of Na arsenate is added to a mixt. formed from NaOAc or NaNO<sub>3</sub>, PbO, H<sub>2</sub>O and a small amt. of HOAc or HNO<sub>3</sub> at a temp. of about 70° and the soln. of Na compds. obtained in filtering and washing the Pb arsenate is used for further reaction with PbO to continue the process.

## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

**The mechanism of alcoholic fermentation and other sugar decompositions.** CARL NEUBERG and JULIUS HIRSCH. *Berl. klin. Wochenschr.* 58, 956-7(1921).—In this lecture the history of the study of fermentation is divided into 3 periods. The first is the period of Gay-Lussac and Thenard; the second is the period of Pasteur, Buchner, Liebig, Traube and Hoppe-Seyler; the third is the period of the finer chemistry as disclosed in the researches of Neuberg. A short review of the newer theories is given. JULIAN H. LEWIS

**The composition of dregs and wine from dregs.** LUCIEN SAMICRON. *Rev. vit.* 56, 349-51(1922).—Analyses of wine decanted from dregs and of that pressed from the same showed, in comparison with the original wines, the following results: A diminution in the alc. content; constancy of the total acidity, fixed and volatile; an increase of the dry ext. by at least 50%; a moderate increase of ash, with diminution of the sol. and increase of the insol. portions, accompanied by a considerable diminution of the alky. of the same; a diminution of the cream of tartar and total tartaric acid by more than 50%, while the total K diminished hardly 10%; an increase of P<sub>2</sub>O<sub>5</sub> by more than 100%. The K bitartrate appeared to have been replaced by biphosphate in approx. mol. proportions. The increase of P<sub>2</sub>O<sub>5</sub> and other differences are attributed largely to the decompn. of yeast cells present. P. R. DAWSON

**The deacidification of wine.** L. FERRÉ. *Ann. fals.* 15, 139-46(1922).—During the hot summer of 1921 certain wines were attacked by bacterial diseases which caused an increase in volatile acidity. In some cases mfrs. added a neutralizing agent to decrease the acidity. To detect this practice methods of analyses for the free and combined volatile and the fixed acids are given. Satisfactory results were obtained with these methods when checked with the usual methods and with analyses of specially prepd. samples of wine. If K compds. were used as neutralizing agents there is an appreciable increase in ash, total K<sub>2</sub>O and ratio of K<sub>2</sub>O to total tartaric acid. If CaCO<sub>3</sub> was used the CaO of the wine increases, the tartaric acid decreases and may be entirely removed. A. P. C.

**Analyses of pure cherry brandies of Zug, Switzerland.** J. HUX. *Mitt. Lebensm. Hyg.* 13, 96-7(1922).—Sp. gr., alc., acidity, esters, HCN, and higher alcs. are reported on 48 samples. H. A. LEPPER

**The preparation, based on chemical determinations, of a nutrient solution for the production of yeast.** F. WENDEL. *Z. Spiritusind.* 45, 160, 166-7, 171-2(1922).—Methods are given for the prepn. of nutrient solns. for the production of baker's yeast based on actual yeast requirements as detd. by a large number of analyses of yeast, wort and spent wort. A good yeast should contain approx. 75% of H<sub>2</sub>O, 1.6-1.8% of N, 0.5% of K<sub>2</sub>O, 0.1% of MgO and 0.6-0.8% of P<sub>2</sub>O<sub>5</sub>. To produce the most active yeast the soln. must be balanced physiologically and the yield must not be too high. High aeration destroys the activity of the zymase. To produce a good yield and an active yeast, having approx. the compn. given above, several formulas, based on the availability of the constituents for yeast growth, are given. C. N. FREY

Acclimatization of brewer's yeast to As (EFFRONT) 11C.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Bismuth amalgam as a therapeutic agent.** HUERRE. *Société de thérapeutique* (Dec. 14, 1921); *Industrie chimique* 9, 261(1922).—As a result of tests carried out on various Bi preps. in the treatment of syphilis, H. was led to det. its curative properties when in the form of amalgam. He was able to prep. an amalgam soft enough to be readily ground to an impalpable powder suitable for mixt. with an oil base. A product of const. compn. is obtained by heating 75 g. of Bi and 25 g. of Hg on the sand bath at 350° and passing CO<sub>2</sub> through the mixt. The cryst. mass obtained on cooling can be ground in an agate mortar without loss of Hg.

A. P.-C.

**Testing and evaluation of fructus anisi.** W. BRANDT AND M. WOLFF. *Ber. pharm. Ges.* 32, 34-48(1922).—A discussion of the methods commonly employed with suggested improvements in evaluating the ext.

W. O. E.

**Estimation of sulfate in neocarsphenamine.** E. ELVOE. *J. Ind. Eng. Chem.* 14, 624-5(1922).—A method is described whereby the sulfate in neocarsphenamine can be detd. without the preliminary pptn., filtration, etc., of the CH<sub>2</sub>O sulfoxylic acid deriv. of the arseno base, which is called for *via* Raiziss and Falkov (cf. C. A. 15, 2960). The results by the latter method, however, are higher than by the direct method; this increase is probably due to further oxidation to sulfate of S present in lower stages of oxidation, during the preliminary pptn., filtration and washing of the ppt. The direct method was used in detg. the sulfate in 34 samples from 10 manufurs. When calcd. as Na<sub>2</sub>SO<sub>4</sub>, the results showed a variation from a min. of 1.4% to a max. of 17.8%. The averages of each manufur's samples separately gave a min. of 1.76% and a max. of 5.82%. It appears, however, that the manufur. can control his process so that his product will not vary very much in its sulfate content. Thus, the av. sulfate content (calcd. as Na<sub>2</sub>SO<sub>4</sub>) of 6 samples from one manufur. was 3.52%, while with the exception of only one sample, the largest difference was only 0.32%; and including this one sample, the largest difference was only 0.73%, although the samples examd. cover a period of manuf. of about 3 years, during which time there were produced about 685 different lot numbers.

W. O. E.

**Testing strychninum nitricum.** F. REIDEL. *Pharm. Ztg.* 67, 479(1922).—Results of the examn. of 2 samples of strychnine nitrate, alleged to be "inactive" or "adulterated with sugar" showed that both samples fulfilled all requirements except in the matter of the color test with concd. H<sub>2</sub>SO<sub>4</sub>. R. finds that strictly speaking even the purest strychnine nitrate develops with concd. H<sub>2</sub>SO<sub>4</sub> after a brief interval a color or faint turbidity. Expts. are described showing the color changes produced by the action of concd. H<sub>2</sub>SO<sub>4</sub> on strychnine with varying amts. of sugar, likewise the behavior of such sophisticated product on treatment with Fehling soln.

W. O. E.

**Preparation of aluminium oleate in laboratory practice.** C. STICH. *Pharm. Zentralhalle* 63, 261(1922).—Treat a soln. of 50 g. Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> in 500 g. H<sub>2</sub>O with NH<sub>3</sub>, wash the pptd. Al<sub>2</sub>(OH)<sub>3</sub> thoroughly with H<sub>2</sub>O, then gently warm 300 g. of the gelatinous mass in 50 g. oleic acid on the H<sub>2</sub>O bath. Collect the prepn. on mull, knead repeatedly with cold H<sub>2</sub>O, and finally dry. Yield 85 g.

W. O. E.

**Bay rum.** F. HARDY. *Agric. News*, Nov. 12, 1921, 336; *Pharm. J.* 108, 88(1922).—Bay rum is a soln. of bay oil in 50% EtOH. Turbidity, showing even with higher % EtOH, is due to *myrcene*, of which old oils contain more than fresh. Dissolve oils of bay, 33.0 cc., orange 2.5, pimento 2.0 cc. in purified EtOH 2000 cc., add H<sub>2</sub>O 1500 cc. slowly while stirring. Shake the turbid colorless liquid with calcined MgO 20 g., and filter. The filtrate is pure yellow and will not leave an unpleasant odor if matured bay oil is used and if the EtOH is purified by redistn. with MgO.

S. WALDBOTT

**Somnifene.** ANON. *Le Médecin*. Dec. 1921; *Practitioner* Feb. 22, 1922, 148; *Pharm. J.* 108, 112(1922).—This new hypnotic is the diethylpropenylbarbiturate of  $\text{NH}_4\text{Et}$ . It is readily sol., and its effects are superior to those of the other barbituric derivs.

S. WALDBOTT

**The assay of mercuric salicylate.** E. F. KELLEY AND J. C. KRANTZ, JR. *J. Am. Pharm. Assoc.* 10, 365(1921).—The U. S. P. assay is faulty. The following process yields good results. Heat 0.5 g. in 15 cc. of  $\text{H}_2\text{SO}_4$  and 10 cc. of  $\text{HNO}_3$  until the soln. is a pale yellow color. Cool, dil. with 150 cc. of  $\text{H}_2\text{O}$ , add 30 cc. of 16%  $\text{NaCl}$  soln., mix and add gradually 5 cc. of dil.  $\text{H}_3\text{PO}_4$ . Stir, allow to stand until the ppt. has subsided, collect the ppt., wash well, transfer it to 50 cc. of 0.1  $N$   $\text{I}$ , add 2 g.  $\text{KI}$ , agitate until the ppt. has dissolved and titrate with 0.1  $N$   $\text{Na}_2\text{S}_2\text{O}_4$ .

L. E. WARREN

**Evaluation of wintergreen leaves.** R. W. ADAMS. *J. Am. Pharm. Assoc.* 10, 366(1921).—Leaves collected by the Indians under supervision of a missionary yielded 1.22, 1.40 and 1.11% of oil. A com. specimen yielded but 0.31%. The first two specimens had been thoroughly dried, while the third had not been completely dried.

L. E. WARREN

**The ash yield of calumba.** E. L. NEWCOMB, C. H. ROGERS AND C. V. NETZ. *J. Am. Pharm. Assoc.* 10, 368-70(1921).—Calumba generally occurs on the market relatively free from dirt. A brush attached to the shaft of a small motor was used for removing the dirt from the drug. Sixteen samples yielded from 3.74 to 9.48% of ash and from 0.2 to 4.54% of acid-insol. ash. Clean drug apparently should not yield more than 5% of ash and not over 1% of acid-insol. ash.

L. E. WARREN

**The constituents of the roots of American ginseng.** YING C. WONG. *J. Am. Pharm. Assoc.* 10, 431-7(1921).—Authenticated roots of *Panax quinquefolium* 4 to 6 years old were examd. Alkaloids were absent. Small amts. of a weak enzyme were found. The ground drug was extd. successively with various solvents and the residues weighed. Petr. ether extd. 0.47%;  $\text{Et}_2\text{O}$  0.85;  $\text{CHCl}_3$  0.12;  $\text{EtOAc}$  1.23;  $\text{EtOH}$  17.49% in the order named. A small amt. of a pale yellow essential oil, a dark brown resinous substance, sugar and a non-toxic saponin, m.  $170-2^\circ$ , were obtained. The saponin gave an acetyl deriv. m.  $100^\circ$ , the latter yielding on hydrolysis a pentose and a sapogenin m.  $188-91^\circ$ .

L. E. WARREN

**The estimation of terpinol hydrate in elixir of terpinol hydrate.** A. G. MURRAY. *J. Am. Pharm. Assoc.* 10, 440-1(1921).—Ext. a measured quantity of the elixir with petr. ether to remove volatile oils. Dil. with  $\frac{1}{4}$  satd.  $\text{NaCl}$  soln. until the  $\text{EtOH}$  content is reduced to about 10 to 15%. Shake out with 4 portions of  $\frac{1}{4}$  vol. each of  $\text{CHCl}_3$  contg. 5 to 7%  $\text{EtOH}$ . Wash each portion of the solvent with 5 cc. of the  $\text{NaCl}$  soln. Filter through cotton, unite the several portions of filtrate, wash the filter with a little  $\text{EtOH}$  and evap. without heat by a blast of air. Wipe off moisture from outside of dish, allow to stand 15 min. and weigh. A sample prepd. according to the N. F. except for the omission of volatile oils was assayed by the method, without the preliminary treatment with petr. ether. The results were 0.8% too high. L. E. W.

**Notes on the ash yield of gentian.** C. E. SMYTHRE AND E. L. NEWCOMB. *J. Am. Pharm. Assoc.* 10, 457-8(1921).—Gentian contains no  $\text{CaC}_2\text{O}_4$ ; consequently its ash might be expected to be low. The ash from 11 samples in various conditions of freedom from dirt, varied from 2.95 to 7.31%. The  $\text{HCl}$ -insol. ash varied from 0.3 to 3.52%. The "cleanings" from some of these samples gave as much as 24% of ash, of which 20.6% was acid-insol. Well cleaned drug should yield 2-2.5% of ash. L. E. W.

**The influence of inhibiting flowering on the formation of alkaloids in the daturas.** A. F. SIEVERS. *J. Am. Pharm. Assoc.* 10, 674-6(1921).—An av. individual plant in each of the several species of *Datura* was selected and the flower buds were removed as soon as they appeared. Other plants of the same species from which the buds were

not removed were used as controls. The treated plants attained the same size as the untreated specimens but the leaves were twice the normal size. Leaves from both kinds of plants were assayed. The alkaloidal findings for the untreated (A) and the treated (B) plants are given. *Datura leichardti* (A) 0.364; (B) 1.281. *D. gigonlea* (A) 0.267; (B) 0.860. *D. quercifolia* (A) 0.347; (B) 1.021. *D. stramonium* (A) 0.622; (B) 1.825. *D. stramonium inermis* (A) 0.311; (B) 1.279. *D. tatula* (A) 0.465, (B) 1.247. *D. tatula inermis* (A) 0.514; (B) 1.517. The results were so unexpected that many questions are suggested.

L. E. WARREN

**The structural relations among opium, berberis, corydalis, and hydrastis alkaloids.** INGO W. D. HACKER. *J. Am. Pharm. Assoc.* 10, 680-8(1921).—Discussion with structural formulas which cannot be abstracted.

L. E. WARREN

**Revising the standards for hydrastis.** E. L. NEWCOMB AND C. E. SMYTHE. *J. Am. Pharm. Assoc.* 10, 187-8(1922).—From the results of a number of exams. of hydrastis, both commercial drug and as produced by the authors, an ash limit of 8% is suggested. The acid-insol. ash should not exceed 3.5%.

L. E. WARREN

**Some constituents of *Viburnum opulus*.** F. W. HEYL. *J. Am. Pharm. Assoc.* 11, 329-38(1922).—Drug from N. Minnesota was extd. with MeOH and the concd. ext. poured into H<sub>2</sub>O. The resin that sepd. gave acetic, valeric, caproic, caprylic, formic, oleic, linoleic, cerotic and palmitic acids. From the unsapond. portion traces of a paraffin, m. 65-70°, and myricyl alc., m. 77°, were obtained. The Et<sub>2</sub>O ext. of the resin contained a phytosterol C<sub>27</sub>H<sub>46</sub>O<sub>2</sub>, m. 265-75°. Another phytosterol, C<sub>27</sub>H<sub>46</sub>O<sub>2</sub>.H<sub>2</sub>O, m. 138°, was also found. The CHCl<sub>3</sub> and EtOAc exts. were not crystallizable. The EtOH ext. contained an acidic resin which gave acetic and valeric acids on sapon. The H<sub>2</sub>O soln. from which the resin had sepd., contained acetic and valeric acids, tannin, sucrose, glucose and an ester-like resin which gave acetic and valeric acids on hydrolysis. The Pb(OAc)<sub>2</sub> ppt. gave a cryst. acid, m. 200-2°, C<sub>11</sub>H<sub>11</sub>O<sub>4</sub>. Traces of a glucoside were obtained by the biochemical method. Alkaloids were absent.

L. E. WARREN

**An unusual alkaloidal precipitant.** W. G. TOPLIS. *J. Am. Pharm. Assoc.* 11, 343(1922).—K citrate soln. ppts. many alkaloids. The alkaloids of opium, cinchona, nux vomica and belladonna gave ppts. Pharmacists are warned of the incompatibility of prescriptions contg. citrates and plant extractives which carry alkaloids.

L. E. WARREN

**The coating of compressed tablets.** ROBT. C. WHITE. *J. Am. Pharm. Assoc.* 11, 345-50(1922).—Very complete directions for the manipulative processes together with a description of the materials used.

L. E. WARREN

**Physics in pharmacy.** J. U. LLOYD. *J. Am. Pharm. Assoc.* 11, 410-23(1922).—Records of a considerable number of physical expts. made nearly 40 years ago, some of which have recently been verified by J. T. Lloyd.

L. E. WARREN

**Preparation of neosarsphenamine.** FREDERICK W. HEYL AND GEO. J. MILLER. *J. Am. Pharm. Assoc.* 11, 432-40(1922).—Minute directions are given for prep. neosarsphenamine by each of two lab. methods. The yields obtained in 17 runs averaged 75% of theory. The As content averaged 18.45%. The toxicity of the product varied with different runs but the m. l. d. for rats averaged 255 mg. per kg., the highest being 320 mg. per kg.

L. E. WARREN

**The place of pharmacy in the world.** H. V. ARNY. *J. Am. Pharm. Assoc.* 11, 441-6(1922).—Address of acceptance of the Third Remington Honor Medal, May 15, 1922.

L. E. WARREN

**Benzyl succinate.** ANON. *Repts. Lab. Am. Med. Assoc.* 14, 71-2(1921).—Benzyl succinate has been suggested as a substitute for benzyl benzoate in spasm of unstriated muscle. It is a solid; practically tasteless; odorless and contains a larger proportion

of  $\text{PhCH}_3$  than benzyl benzoate. Three brands were examd.;  $\text{SO}_4$ ,  $\text{Cl}$ ,  $\text{C}_7\text{H}_5\text{O}_4$  were absent; ash and loss on drying were negligible; soln. in  $\text{EtOH}$  clear and colorless. Benzyl succinate was detd. by sapon. with alc.  $\text{KOH}$ . Stearn's brand m.  $44.5-45^\circ$ ; benzyl succinate 99.74%. Seydel brand m.  $46.5^\circ$  to  $47^\circ$ ; benzyl succinate 99.46%. Hynson, Wescott and Dunning m.  $46.2^\circ$ , benzyl succinate 99.74%. Standards are suggested which exclude more than 0.1% of ash, and require at least 99% of benzyl succinate.

L. E. WARREN

**Amylzyme.** ANON. *Repts. Lab. Am. Med. Assoc.* **14**, 72-4(1921).—Amylzyme is an ext. from the pancreas which is stated to convert 110 to 130 times its wt. of anhydrous starch to the colorless end-point in 10 min., if tested by the method adopted by the Council on Pharmacy and Chemistry. Four specimens were tested. No. 1 powder, 111 parts; No. 2 (capsules) 80 parts; No. 3 (capsules 6 mo. after purchase) 108 parts; No. 4 capsules, assayed directly after purchase 121 parts. L. E. WARREN

**Holadin.** ANON. *Repts. Lab. Am. Med. Assoc.* **14**, 74(1921).—Holadin is a pancreatic ext. which is claimed to convert 135 parts of air-dried starch to the colorless end-point in 10 min., if tested by the Council method (cf. preceding abst.). A test on one specimen converted 82.5 parts of anhydrous starch. If 15% of  $\text{H}_2\text{O}$  be allowed the findings are still below the claim.

L. E. WARREN

**d-Glucose.** ANON. *Repts. Lab. Am. Med. Assoc.* **14**, 75-6(1921).—Two specimens were examd. Pfanstiel brand. Loss at  $100^\circ$  0.06%; ash negligible;  $[\alpha]_D -51.96^\circ$ . Digestive Ferments Co. brand. Loss at  $100^\circ$  0.04%; ash negligible;  $[\alpha]_D -52.01^\circ$ . Standards are suggested that require at least 98% of anhyd. dextrose, practical absence of the salts of heavy metals, and ash, not over 1% of loss on drying and an  $[\alpha]_D$  of not less than  $-51.7^\circ$ .

L. E. WARREN

WEITZ, RENÉ: Les Lyciums Européens et exotiques. Recherches historiques, botaniques, chimiques et pharmacologiques. Paris: Vigot frères, 20 rue de l'Ecole de Médecine. 15 fr. Reviewed in *J. Pharm. Belg.* **4**, 179(1922).

**Medicinal compound from araroba extract.** J. P. SCHAMBERG and G. W. RAIZISS. U. S. 1,417,771, May 30. Amorphous powdered araroba ext. is dissolved in  $\text{HOAc}$  in the presence of metallic  $\text{Sn}$  at the b. p. and the soln. is repeatedly treated with  $\text{HCl}$  at the b. p., filtered, the filtrate is washed for the removal of  $\text{HOAc}$  and the residue is cooled to sep. a cryst. ppt. This product is yellow, m. about  $190^\circ$ , is slightly sol. in ether and  $\text{MeOH}$  and more sol. in glacial  $\text{HOAc}$ ,  $\text{CHCl}_3$ ,  $\text{C}_6\text{H}_6$  and  $\text{EtOH}$ . It is adapted for treatment of psoriasis.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

**Recovery of platinum from used contact mass at the Old Hickory powder plant.** A. L. KIBLER. *J. Ind. Eng. Chem.* **14**, 636-41(1922).—The process used is described in great detail. The Pt actually recovered was 8283 oz. troy, or 91.7% of the amt. believed to have been in the mass. Assuming 450 oz. in residues which were not worked up, the total recovery would have been 96.7%. The cost of the plant and its operation amounted to \$4.85 per oz. Pt actually recovered, not counting any salvage value for the plant.

F. C. Z.

**Phosphoric acid: its uses and manufacture.** L. CARPENTER. *Chem. Age (London)* **6**, 830-1(1922).

E. H.

1922

**The Fixed Nitrogen Research Laboratory.** ANON. *Chem. Age* (N. Y.) 30, 266-7 (1922).—An illustrated description. E. H.

**Manufacture of nitric acid by the arc process.** GROS. *Société des Ingénieurs Civils* (April 7, 1922); *Technique moderne* 14, 279(1922).—A discussion showing that the arc process is the most satisfactory and economical one for the synthesis of  $\text{HNO}_3$  in France. A. P.-C.

**Sulfur, pyrites and sulfuric acid in 1920.** P. S. SMITH. U. S. Geol. Survey, *Mineral Resources of U. S., 1920*, Part II, 301-8 (preprint No. 31, published June 16, 1922). E. H.

**Barium and strontium in Canada.** H. S. SPENCE. Can. Dept. Mines, *Mines Branch No. 570*, 100 pp.(1922). E. H.

**Magnesium in 1921.** G. F. LOUGHLIN. U. S. Geol. Survey, *Mineral Resources of U. S., 1921*, Part I, 19-20 (preprint No. 4, published June 14, 1922). E. H.

**Fuller's earth in 1921.** JEFFERSON MIDDLETON. U. S. Geol. Survey, *Mineral Resources of U. S., 1921*, Part II, 21-2 (preprint No. 6, published June 16, 1922). E. H.

**Graphite in 1921.** L. M. BEACH. U. S. Geol. Survey, *Mineral Resources of U. S., 1921*, Part II, 7-12 (preprint No. 2, published June 5, 1922). E. H.

**Bone charring.** CG. ILLERT. *Chem. App.* 9, 102-3(1922).—An outline of the process with 1 cut of the Ruf retort oven. J. H. MOORE

**Adsorption carbon.** P. HONIG. *Chem. Weekblad* 19, 259-60(1922).—Good adsorption C is obtained by impregnating the org. material before heating with a salt soln. A  $\text{ZnCl}_2$  soln. is used in that way by the "Aussiger Chemische Werke" in making their "Carboraffin." A sample of an American adsorption C which adsorbed gas very well did not adsorb the impurities of raw sugar solns. as the cavities were too small to allow diffusion in aq. soln. The adsorption by such adsorbents is better the higher its C of content. R. BRUTNER

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Water hyacinth ash as a fertilizer and source of potash (ANON.) 15.

**Chromium oxide; sodium sulfide.** C. J. HEAD. *Brit.* 166,289, Jan. 15, 1920.  $\text{Cr}_2\text{O}_3$  and  $\text{Na}_2\text{S}$  are obtained by heating under reducing conditions a mixt. of  $\text{Na}_2\text{CrO}_4$ , S, and C in the stoichiometric ratio of 1:2:5. The product is leached, the  $\text{Cr}_2\text{O}_3$  being washed, dried, and calcined. The  $\text{Na}_2\text{S}$  soln. may be evapd. to dryness. The  $\text{Cr}_2\text{O}_3$  may be further purified by digesting with  $\text{Na}_2\text{CO}_3$ , washing with hot  $\text{H}_2\text{O}$ , and drying.

**Distilling sulfuric acid.** G. BAUM. U. S. 1,419,008, June 6. A body of the acid is heated by radiation from an incandescent material such as an elec. heated resistance coil above the surface of the acid.

**Evaporating kettle adapted for concentrating acids.** H. W. PAULUS. U. S. 1,418,878, June 6. A series of U-shaped tubes through which steam may be circulated is adapted to be immersed in the kettle when desired to heat its contents.

**Hydrogen and nitrogen for ammonia synthesis.** E. SZARVASY. U. S. 1,417,952, May 30. A mixt. of N and  $\text{CH}_4$  is heated, in a decomposing chamber contg. glowing C from a previous operation, to produce a mixt. of N and H in correct proportions for making  $\text{NH}_3$ .

**Alkali metal cyanide.** F. VON BICHOWSKY and J. HARTMAN. U. S. 1,417,702, May 30. Ti nitrides are heated with Fe carbide and  $\text{Na}_2\text{CO}_3$  or Na formate in the absence of free C to produce NaCN.

**Purifying sodium carbonate.** F. H. MERRILL. U. S. 1,419,463, June 13. Carbonaceous matter is eliminated by heating with  $\text{NaNO}_3$ .

**Potash from leucitic rocks.** G. A. BLANC and F. JOURDAN. U. S. 1,418,356, June 6. Leucitic rocks are calcined and finely powdered and then treated with an org. acid such as citric, acetic, formic or oxalic acid in order to obtain sol. K compds. Cf. C. A. 15, 725.

**Potassium compounds from glauconite.** D. D. JACKSON. U. S. 1,417,919, May 30. Natural potassiferous materials, such as glauconite, are heated with lime and NaCl or CaCl<sub>2</sub> at a temp. (preferably about 1150–1190°) which is below the clinkering temp. but high enough to effect rapid formation and volatilization of KCl.

**Potassium sulfate and hydrochloric acid.** P. COMMENT. U. S. 1,417,887, May 30. Finely pulverized KCl is mixed with H<sub>2</sub>SO<sub>4</sub> in such proportions that the moist mixt. remains as pulverulent as possible and the mixt. is heated in a direct-flame furnace, first to desiccate it and later to temps. of about 300° and then 700–800° to form K<sub>2</sub>SO<sub>4</sub> and HCl.

**Decomposing potassiferous rocks with hydrochloric acid.** F. JOURDAN. U. S. 1,417,831, May 30. Complex rocks such as leucitic rocks contg. K compds. together with chlorides or other salts of Fe, Al, Ca and Mg are treated with HCl at a temp. of 300–600° and the HCl may be recovered.

**Zirconium chloride.** L. BURGESS. U. S. 1,418,528, June 6. Zr chloride is formed by reaction of gaseous HCl on the product obtained by heating a Zr ore with C.

**Treating beryllium ores.** L. BURGESS. U. S. 1,418,527, June 6. Oxidized Be ore is heated with C to produce compds. of Be, Si and C and Be chloride is then formed by treatment of the Be-contg. product with gaseous HCl.

**Solidifying molten sulfur.** R. F. BACON and H. S. DAVIS. U. S. 1,419,911, June 20. Overlying films of molten S are successively cooled to build up a mass of solid S.

**Apparatus for hydrating lime.** J. C. SCHAFER. U. S. 1,420,163, June 20. The app. comprises a steam-retaining housing with superposed horizontal partitions over which the lime is fed while being hydrated.

**Lampblack.** W. K. LEWIS. U. S. 1,418,811, June 6. In producing C black by the imperfect combustion of natural gas, the combustion is effected in the presence of about 15–20 times as much combustion gas or other inert gas which serves to sep. the C particles as formed and prevent their aggregation.

**Lampblack and hydrogen.** H. J. MASSON. U. S. 1,418,385, June 6. C black and H are produced by passing natural gas or other hydrocarbon material through a mass of molten metal or slag maintained at a cracking temp. and the C particles are removed from the molten material with sufficient rapidity to maintain their black color and softness.

**Plastic material from mineral or fibrous substance and phenol condensation product.** SADAKICHI SATO. Jap. 39,321, July 19, 1921. The sticky phenol condensation product (100 parts) prepd. by the method described in No. 37,857 (C. A. 16, 1301) is mixed with 200–300 parts mineral matter, such as tale, clay, kaolin, mica, etc., or 50 parts fibrous substance, such as cotton, hemp, pulp, wood, asbestos, etc., to a plastic material. It is shaped into a suitable form and heated at 70–120°, for a few hrs., to form a hard and plastic material.

**Mica sheets and plate.** SADAKICHI SATO and ICHIJURÔ SATO. Jap. 39,322, July 19, 1921. Mica produced in Korea is mainly composed of muscovite and zeolite. The former is resistant to heat and acid, while the latter is non-resistant and has little elec. insulating power. When heated below red heat, zeolite expands by the evapn. of H<sub>2</sub>O and dissolves in HCl or H<sub>2</sub>SO<sub>4</sub>. Muscovite, remaining after the above treatment, is washed with H<sub>2</sub>O and rolled to fine scales. It is made into sheets with casein,

paste or glue as sizing material. The sheets thus formed are united with shellac, etc., to a plate.

**Phenol condensation products.** SADAKICHI SATO. Jap. 39,320, July 19, 1921. A stable condensation product is prepd. by treating an oily condensation product from phenol and formaldehyde with acidic or basic metallic salts under atm. pressure. The OH or CH<sub>2</sub>OH of the oily compd. combines with basic or acidic salts. E. g., a mixt. of mol. proportions of phenol and formaldehyde and 0.05–0.1 mol. Na<sub>2</sub>SO<sub>4</sub> is heated at 90° for 2–3 hrs. The oily product is sepd. from H<sub>2</sub>O and then from phenol and aldehyde by vacuum evapn. Metallic salt (2–6%), such as CuSO<sub>4</sub>, NiSO<sub>4</sub>, ZnCl<sub>2</sub>, CaCl<sub>2</sub>, Al(OH)<sub>3</sub>, or Cu(OH)<sub>2</sub>, is added, mixed thoroughly and heated at 95° for 5 hrs. and at 120° for a few hrs. Metallic salts used are added in soln. or, preferably, colloidal soln., with a mixt. of glycerol and org. acids, such as lactic acid, as a solvent. A mixt. of 2 or more metallic salts may be used. The product is used for the same purpose as bakelite.

**Phenolic condensation product.** D. S. KENDALL. U. S. 1,418,718, June 6. An aq. PhOH mixt. is formed contg. sufficient CH<sub>3</sub>O to react with the PhOH and form a fusible resin and sufficient (CH<sub>3</sub>)<sub>4</sub>N<sub>4</sub> to react with resin to form an infusible product and the mixt. is heated to cause partially complete reactions and produce a soln. contg. fusible resin and (CH<sub>3</sub>)<sub>4</sub>N<sub>4</sub> but substantially free from uncombined CH<sub>3</sub>O.

**Mixture for cleaning metals or glazed ware.** E. E. HULLINGER. U. S. 1,418,800, June 6. Steel wool is satd. with paraffin and paraffin oil and coated with pumice stone.

**Fireproofing fibrous materials.** A. ARENT. U. S. 1,418,610, June 6. A soln. of SbCl<sub>3</sub> in C<sub>6</sub>H<sub>6</sub> is applied to shingles, cloth or paper.

**Friction linings for brakes and the like.** F. C. STANLEY. U. S. 1,417,778, May 30. Felted unwoven sheet fabric such as an asbestos fabric is successively satd. with linseed oil 94 and gilsonite 6% and baked after each satn. U. S. 1,417,779 relates to felted asbestos brake lining satd. with a baked sulfurized binder such as sulfurized linseed oil. Cf. C. A. 16, 2203.

**Brake friction material.** W. ACHTMAYER. U. S. 1,418,607, June 6. Asbestos brake linings or the like are impregnated with a condensation product of PhOH and methylenediphenyldiamine.

**Detergent.** F. H. GUERNSEY. U. S. 1,419,625, June 13. A detergent adapted for softening H<sub>2</sub>O used with it is prepd. from 1 mol. proportion of Al<sub>2</sub>O<sub>3</sub> and 8 or more mol. proportions of SiO<sub>2</sub> and one less mol. proportion of Na or K oxide together with an emulsifying agent such as fatty oil and sufficient alkali to compensate for that consumed during the detergent action of the compn. when it is used. The compn. is solid at summer temps.

**Chewing gum from rubber.** W. A. BEATTY. U. S. 1,418,271, June 6. A base for chewing gum is prepd. by dissolving nitrogenous substances from rubber by prolonged treatment with 5% NaOH or KOH soln. and then heating the rubber with an inert gas such as H, N or CO<sub>2</sub> to remove volatile substances.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

**Notes on diagnosing causes of cords in glass.** P. TWYMAN. *J. Am. Ceram. Soc.* 5, 289–93(1922).—Cords usually, if not always, have physical properties distinctly



different from those of the glass itself. These properties are  $n$ , viscosity, coeff. of expansion and liability to devitrification. Simple common-sense methods for ascertaining relative values are given. Brief abstracts of the methods are hardly possible. In many cases the cause of the cords may be immediately fixed. C. H. KERR

Atmospheric pressure and refractive indices, with a corresponding table of indices of optical glass. J. W. GIFFORD. *Proc. Roy. Soc. (London)* 100A, 621-6(1922).—In work where an accuracy better than about a unit in the sixth significant figure is required it is necessary to allow for the effect of the variation of refractive index of air with variation in the barometric pressure. A table is given of the refractive indices to 7 figures for 13 different wave lengths from 7682 K to 4048 Hg for 3 crown and 4 flint glasses. E. D. WILLIAMSON

Report for the year 1922. COMMITTEE ON STANDARDS, AMERICAN CERAMIC SOCIETY. *J. Am. Ceram. Soc.* 5, Year Book, 1921-22, 31-93(1922).—Instructions are given for sampling and for prepn. of the sample. Standard methods are given for detg. drying shrinkage,  $H_2O$  of plasticity, shrinkage and pore  $H_2O$ , behavior in firing, softening point, true sp. gr., ultimate chem. analysis, sag test, tensile strength, slaking, load test. Tentative methods for testing electrical porcelain are given. C. H. KERR

The plasticity of clays. F. P. HALL. *J. Am. Ceram. Soc.* 5, 346-54(1922).—None of the present methods of measuring plasticity is perfectly satisfactory. Plasticity seems to be the resultant of two or more factors. The Bingham plastometer, which measures resistance to plastic flow through capillary tubes, is the most rational and satisfactory. C. H. KERR

Fire clays of the eastern coalfield of Kentucky. H. RIES. *J. Am. Ceram. Soc.* 5, 397-408(1922).—There are 2 horizons of workable, refractory clays. One, bearing flint, semi-flint and plastic clay, is proven to be of upper Pottsville age and rests unconformably on the Mississippian formations. The other, found in Boyd and eastern Carter Co., is in the Allegheny series and carries plastic fire clays of less value. The various deposits are described. C. H. KERR

Lamination, a discussion of cause and cure. J. J. FRED. BRAND. *J. Am. Ceram. Soc.* 5, 355-75(1922).—There are 2 general types: (1) that arising from differential flow of various parts of the clay column, and (2) that resulting from imperfect union of formed masses. The various causes are discussed. The removal of air from clays prior to and during tempering and pugging offers great opportunities of improved clay products. C. H. KERR

Heat transmission, with special reference to the stoker-fired boiler. R. M. HOWE AND S. M. PHELPS. *J. Am. Ceram. Soc.* 5, 420-9(1922).—When furnace gases are under pressure they penetrate the brick and increase its temp. When the gases are under draft, cold air is drawn through the brick, lowering its temp. Spalling is a function of vitrification and is therefore associated with furnace pressure, being greater when the pressure is positive than when it is negative. This may also explain the lack of concordance of thermal cond. data. C. H. KERR

The adaptability of the gas-fired compartment kiln for the burning of clay products. W. D. RICHARDSON. *J. Am. Ceram. Soc.* 5, 254-8(1922).—Its advantages include (1) large fuel saving, (2) reduced factory space, (3) quicker burning, (4) better control, (5) lower cost of operation, (6) greater range of adaptability than any other kiln. C. H. KERR

Data on the operation of a continuous kiln at the plant of the A. C. Spark Plug Company. S. J. McDOWELL AND P. D. HEUSER. *J. Am. Ceram. Soc.* 5, 267-75(1922).—The kiln is 2'8" wide, inside, and 75' long. Burning to cone 18, half down, requires only 12 hrs. The spark plugs are fired directly, being unprotected. Results are satisfactory. C. H. KERR

**Some experiments on the firecracking of terra cotta.** E. C. HILL. *J. Am. Ceram. Soc.* 5, 299-310(1922).—Firecracking shows as fine hair-line cracks extending into the body. Slow cooling prevented firecracking on all samples tried. The rate of cooling is more important than the compn. or properties. Sandy clays showed a greater tendency than non-sandy clays. No definite relation was found between porosity or transverse strength and tendency to firecrack. The kind of grog seems less important than the kind of clay. Increase in % grog reduces the tendency to firecrack and very fine grog is worse than medium or coarse grog. But the rate of cooling is the most important factor. C. H. KERR

**Comparative tests of American and foreign table ware.** H. H. SORTWELL. *J. Am. Ceram. Soc.* 5, 276-88(1922).—The American wares were found superior to the English, French, German and Japanese wares in all tests, including resistance to grazing, resistance to sudden temp. changes and impact. Plates of hotel ware and domestic ware were tested. Resistance to chipping at the edge seemed to depend more upon the shape than upon compn. All of the glazes resisted severe attack by alkaline solns. for 25 hrs. A mass of data is given including absorption, porosity and bulk sp. gr. C. H. KERR

**Painting in underglaze colors on the biscuit.** FRED. H. RHEAD. *J. Am. Ceram. Soc.* 5, 376-83(1922).—Many formulas and full directions are given covering present-day practice. Brief abstracting is impossible. C. H. KERR

**A simplified method of determining the dry volume of clay briquets.** J. L. CRAWFORD. *J. Am. Ceram. Soc.* 5, 394-6(1922).—Dry vol. is detd. by dividing the dry wt. by the bulk sp. gr. This eliminates satn. of test pieces with kerosene. C. H. KERR

**Relation of composition to thermal shock in steel enamels.** B. T. SWEELY. *J. Am. Ceram. Soc.* 5, 263-5(1922).—It seems logical that if the coeff. of expansion of the finish enamel is lower than that of the steel and first coat, the stress resulting from temp. change will be less and the probability of failure less. Also a high coeff. of the ground coat would give a high contraction over the temp. interval occasioned by the loss of heat through the cover enamel when the piece is immersed, thus increasing resistance to shock. Expts. supported these views. A white enamel (cubical coeff.  $334 \times 10^{-7}$ ) spalled off in one or two trials when put over No. 1 ground coat (cu. coeff.  $318 \times 10^{-7}$ ) while the same enamel withstood the shock much better when put over No. 2 ground coat (cu. coeff.  $432 \times 10^{-7}$ ). C. H. KERR

**An experiment in electric smelting glass enamel.** E. E. GEISINGER. *J. Am. Ceram. Soc.* 5, 248-53(1922).—An elec. enamel furnace was tried at the General Electric Co. The glass melted was a blue-black enamel contg. Mn, Ni and Co. The furnace was of the C arc and granular resistor type. Crucibles 8 in. high were used. Complete fusion, without reduction of the metallic oxides or change in character of the enamel, was obtained. C. H. KERR

**Microscopic study of ground coat and cover coat enamel reactions.** E. E. GEISINGER. *J. Am. Ceram. Soc.* 5, 322-37(1922).—A study of the cross-section of the enamel gives more and better information than a study of the surface. The degree of susceptibility to furnace gases is easily shown. If the flowing temps. of ground and cover coats are too near together there will be much intermingling of the two coats. Tendency toward excessive gasification, as in high  $TiO_2$  enamels, is readily observed. Thirteen photomicros are reproduced. C. H. KERR

**A modification of the empirical formula in glaze and enamel calculations.** J. E. HANSEN. *J. Am. Ceram. Soc.* 5, 338-45(1922).—A new type of molecular formula is proposed. In the first group are:  $Na_2O$ ,  $Na_2F_2$ ,  $K_2O$ ,  $CaO$ ,  $CaF_2$ ,  $BaO$ ,  $ZnO$  and  $PbO$ . In the second group are:  $Al_2O_3$  and  $Al_2F_6$ . In the third group are:  $SiO_2$ ,  $SiF_4$ ,  $B_2O_3$  and  $Sb_2O_3$ . The advantages are: (1) simple and graphic, (2) indicates the

mineralogical and physical condition in which the important constituents are used, (3) ease of correct calcn. back to raw materials, and (4) the conclusions drawn from such empirical formula study are sound.

C. H. KERR

**Developments in 1921 in electric vitreous enameling furnaces.** JAS. W. CARPENTER. *J. Am. Ceram. Soc.* 5, 409-19(1922).—The first elec. furnace for vitreous enameling was installed in 1920 by the St. Louis Brass Mfg. Co. Several 1921 installations are described. Future developments promise far-reaching advances.

C. H. KERR

**Types of glazes suitable for decorative inlay processes.** FRED. H. RHEAD. *J. Am. Ceram. Soc.* 5, 259-62(1922).—Typical glazes are:

	White mat glazes.				White transparent.			Wh. enamel.		White.
	Cone 03-01.	03-01.	1-3.	10-12.	03-01.	1-3.	8-10.	03-01.	9-11.	1-3.
White lead.....	200	225	52	...	330	185	310	355	...	...
Feldspar.....	110	55	24	500	160	55	240	220	435	225
Flint.....	35	90	..	125	175	35	225	185	125	165
Whiting.....	25	12	18	250	45	12	150	90	170	90
China Clay.....	35	26	20	250	8	...	50	...	175	5
Zinc Oxide.....	30	74	5	35	14	10	40	...	...	10
Cornwall Stone.....	85	...	24	...	...	55	240	...	...	...
BaCO <sub>3</sub> .....	30	...	..	...	5	...	17	...	...	...
SnO <sub>2</sub> .....	25	...	..	...	...	...	10	175	50	180
Ground Flint Glass..	...	...	..	...	200	...	60	...	85	...
Borax.....	...	...	..	...	15	...	5	...	...	...

To the above white bases, stains may be added as usual. A 10% soln. of gum tragacanth is mixed with the glaze to a creamy consistency. Details regarding application are given.

C. H. KERR

**Electrical porcelain research.** M. H. HUNT. *Elec. J.* 19, 94-6(1922).—The combined efforts of the elec. engineer, physicist, chemist and ceramist have resulted in the production of elec. porcelain along more scientific lines. A modern lab. is illus. Properties of the ingredients that enter the body, those of the body as a whole, and those of the fired porcelain are considered in evaluating elec. porcelain, in addition to the behavior on burning. For the present at least research will be largely concd. on present materials and present general procedures. Standardization of test pieces, app. and tests seems impossible.

W. H. BOYNTON

**Economic handling of materials in porcelain manufacture.** A. P. BALL. *J. Am. Ceram. Soc.* 5, 235-47(1922).

C. H. KERR

**The tensile strength of porcelain.** F. H. RIDDLE and J. S. LAIRD. *J. Am. Ceram. Soc.* 5, 385-93(1922).—A shot machine with special grips was used. Test specimens of dumb-bell shape were found better than conical specimens. The shoulders, but not the smaller central section, are glazed. Good porcelain runs from 3 to 6,000 lbs. sq. in. tensile strength with high temp. porcelains running up to 10 or 12,000 lbs. The ratio of tensile to compressive strength was found to be 1 : 5.90 for the special porcelain studied and 1 : 7.66 as an average for 22 other porcelains. Cf. *C. A.* 16, 997.

C. H. KERR

**Beryl as a constituent in high-tension insulator porcelain.** ROBT. TWELLS, JR. *J. Am. Ceram. Soc.* 5, 228-34(1922).—In the expts. flint and feldspar were partially replaced by beryl. Bar and disc test pieces were fired to cone 8 $\frac{1}{4}$  and to cone 10 (or 10 $\frac{1}{4}$ ), and tested. When properly introduced beryl increased transverse strength, impact strength, heat resistance and dielectric strength. The best results were obtained within the limits: beryl, 21.65-37.63%; flint, 0.0-5.83%; feldspar, 13.30-23.98%; clay 48.54%.

C. H. KERR

**Abrasive materials in 1921.** L. M. BEACH and A. T. COONS. *U. S. Geol. Survey,*

*Mineral Resources of U. S., 1921*, Part II, 15-18 (preprint No. 4, published June 15, 1922).

**Silica in 1921.** L. M. BRACH. U. S. Geol. Survey, *Mineral Resources of U. S., 1921*, Part II, 19-20 (preprint No. 5, published June 16, 1922).

E. H.

E. H.

Report of the Refractory Materials Research Committee (BROADBERRY, *et al.*)  
21. Standardization of china clay (STRACHAN) 23. Electrical tests for porosity of electrical porcelain (SHRADER) 4.

**Opal glass.** A. L. D. D'ADRIAN. U. S. 1,419,032, June 6. An ordinary glass compn. is combined with fluostannite of Mg, Ba or Pb or other metals or silicofluorides to produce opal glass.

**Milky semitransparent glass.** KITSUZŌ FUWA and THE TOKYO DENKI KABUSHIKI Kaisha (the Tokyo Electric Co.). Jap. 39,448, Aug. 3, 1921. Glass is made by adding 1.5-3.0% cryolite, 0.5-3.0% BaSO<sub>4</sub> and below 1% NaCl to a common glass. The best total compn. is sand 100.0, steatite 33.5, litharge 7.5, ZnO 3.0, NaNO<sub>3</sub> 6.1, Na<sub>2</sub>CO<sub>3</sub> 34.6, boric acid 4.5, arsenic oxide 0.5, BaSO<sub>4</sub> 1.5, cryolite 3.8, NaCl 1.9 and antimony oxide 0.4. Microscopical bubbles produced in the material make it milky and semitransparent. It is suitable for illuminating materials, such as a shades for elec. lamps.

**Machine for manufacturing bricks.** SÔTARŌ TAKAHASHI. Jap. 39,444, Aug. 3, 1921.

**Firing earthenware.** C. J. KIRK. U. S. 1,418,446, June 6. The articles to be fired are passed through heating zones in which the temps. are independently controlled.

**Refractory composition.** C. A. FRENCH. U. S. 1,418,372, June 6. Zr oxide and steatite are used together to form a compn. adapted for crucibles, furnace linings or spark plug insulators.

**Refractory material.** R. W. HULL. U. S. 1,418,648, June 6. A refractory material adapted for lining furnaces is formed of the residue remaining from the conen. of Cr ore contg. a mixt. of SiO<sub>2</sub>, serpentine and olivine, united by a binder such as pitch, tar or Al<sub>2</sub>O<sub>3</sub>.

## 20—CEMENT AND OTHER BUILDING MATERIALS

C. N. WILEY

**New developments in oxychloride stucco and flooring.** J. B. SHAW and G. A. BOLE. *J. Am. Ceram. Soc.* 5, 311-21 (1922).—High cost has been an important obstacle to the use of oxychloride cements. The use of calcined dolomites and CaCl<sub>2</sub> may help to overcome this. CaCl<sub>2</sub> can be substituted for MgCl<sub>2</sub> only under special conditions. CaCl<sub>2</sub> solns. must be much more dil. Less filler can be used with MgCl<sub>2</sub>. Mixts. of MgCl<sub>2</sub> and CaCl<sub>2</sub> were not satisfactory. Some good dolomite-CaCl<sub>2</sub> cements were made which have weathered well for 2 yrs. Excellent cements were formed in the dolomite-MgCl<sub>2</sub> series, some equal to the MgO-MgCl<sub>2</sub> cements of equal MgO content. Many promising mixts. are indicated.

C. H. KERR

**Concrete.** L. G. DALHOFF, and W. K. LUNN. Brit. 173,965, Dec. 22, 1920. Porous bodies for use as aggregates for light concrete are made by sintering, at about 1200°, a mixt. of moler and granite, gneiss, basalt, or other rock contg. feldspar. Instead of ordinary moler, black moler or a mixt. of clay and kieselguhr may be used.

**Mortar and building-block composition.** J. J. LAMON. U. S. 1,418,810, June 6. Ground yellow or white blast-furnace slag 7, sand 1, cement 1, lime 0.07 part and sufficient  $H_2O$  to form a moldable plastic compn.

**Plaster mixture.** W. T. FELS. U. S. 1,419,665, June 13. A mixt. of ashes 60, plaster of Paris 30, lime 9 and glue 1% is used for finishing walls.

**Composition for building-blocks.** F. PATER. U. S. 1,418,160, May 30. Asbestos aggregate 5-7, portland cement 1,  $Ca(OH)_2$  0.1-0.2 parts are mixed with  $H_2O$  and molded.

**Wall covering or putty containing magnesium oxychloride.** K. WOLF. U. S. 1,418,896, June 6. "Condensed" magnesite is heated to a low glowing temp., slaked after cooling, calcined and mixed with  $MgCl_2$  soln.

**Recovering components of waste bituminous felt products and the like.** L. KIRSCHBRAUN. U. S. 1,417,840, May 30. The material is mechanically disintegrated in the presence of a hot emulsifying agent such as clay and  $H_2O$  which serves to soften the material and reduce it to a uniform pulp.

**Saturating felt sheets with bituminous material.** L. KIRSCHBRAUN. U. S. 1,417,841 May 30. A hot bituminous compn. is applied in liquid form to one face of a hot dry sheet as it is being wound in a roll.

**Bituminous material from wax tailings.** L. KIRSCHBRAUN. U. S. 1,417,838, May 30. A yellowish brown pitchy material of conchoidal fracture when cold, adapted for making roofing is obtained by steam distn. of wax tailings.

**Waterproofing cement compositions.** G. H. HAVENS. U. S. 1,418,374, June 6. A mixt. contg. hydraulic cement, hydrated lime, slippery-elm bark, alum and  $CuSO_4$  is used for building purposes.

**Bituminous waterproofing composition.** L. KIRSCHBRAUN. U. S. 1,417,837, May 30. Bituminous material in the form of discrete particles is suspended in an aq. mixt. which also contains an oxidizing agent such as driers or S to prep. a compn. adapted for use with fiber in making waterproof sheets.

**Waterproof sheet material.** L. KIRSCHBRAUN. U. S. 1,417,839, May 30. A colored emulsified matrix is formed from materials such as clay and pitch from petroleum wax tailings mixed with dyes and fibrous material of a different color from the matrix material and mottled sheets are formed of the mixt.

**Waterproofed fiber board.** L. KIRSCHBRAUN. U. S. 1,417,836, May 30. Thin plies of felted fibrous material are satd. with waterproofing compn. and united to each other with portland or magnesite cement or other adhesive material. A granular facing material such as gravel may be applied to the exposed surface of the multi-ply sheet to adapt it for use as roofing.

**Clay emulsion adapted for waterproofing fiber sheets.** L. KIRSCHBRAUN. U. S. 1,417,835, May 30. An aq. mixt. of clay is treated with a waterproof adhesive such as asphalt and the ingredients are emulsified so that the adhesive binder forms the internal phase. This emulsion is then combined with more  $H_2O$  and colloidal clay.

**Fire- and water-proof plaster.** MOTOSABURŌ ŌURA and SURO IWAYA. Jap. 39,353, July 21, 1921. A mixt. of  $MgO$  7.5 kg., root of the hydrosme (rivieri) 37.5 g. alum 37.5 g. and a suitable quantity of mineral or vegetable fiber is agitated with 2.16 l.  $H_2O$  at  $80^\circ$ . The product is used instead of linoleum.

**Protective coatings on metals.** J. H. YOUNG. U. S. 1,418,348-9, June 6. Corrodible metals such as Fe or steel are coated with a layer of bituminous or hydrocarbonaceous substances such as asphalt with an overlying layer of metallized paper or vegetable parchment. Cf. C. A. 15, 1065.

**Preserving wood.** A. ARENT. U. S. 1,418,609, June 6. Wood is preserved and rendered resistant to fire by treatment with  $SbCl_3$  dissolved in alc.,  $AmOAc$  or  $CCl_4$ .

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

**Froth flotation tests on bituminous coking coal.** O. C. RALSTON AND GAICHI YAMADA. *Chem. Met. Eng.* 26, 1081-7(1922).—The second article of this series (cf. *C. A.* 16, 1848) gives results of the following expts: (1) sink-and-float tests on the raw coal to det. the fineness necessary to liberate the max. amt. of ash and to provide a standard of permissible ash in flotation coal concentrate; (2) tests on flotation of coal finely ground under water, with various kinds of oils to det. the efficiency of the process under extreme conditions; (3) parallel tests of wet and dry crushed coals of different sizes; and (4) tests on a definite flow sheet with roughing and cleaning operations in various combinations. In all cases the most finely divided material was the first to float and little or no oil was needed; the addition of an agent tended to "overoil" this part of the coal, producing a dirty concentrate. In ordinary froth flotation employing thin oils or soluble frothing agents, which gave the best results, the order of flotation was clean coal, bony coal, and finally, ash. The flow sheet giving the best results was found to be roughing treatment followed by cleaning of both concentrate and tailing from the roughing cell, with the discarding as tailing of all sink fractions in the re-treating cells. A Washington coal of 23.4% ash by this treatment yielded a concentrate of 10.7% ash with a recovery of 63.7% of the pure coal. Inclusion of middlings would raise the ash to 15% with a total coal recovery of 88.9%. Oil consumption was 2.26 lb. crude turpentine per ton.

H. L. OLIN

**Method of representing the structure of coal seams.** F. S. SINNATT. *Iron Coal Trades Rev.* 104, 897(1922).—Abstr. The 4 ingredients which constitute coal, *vitrain*, *clarain*, *durain* and *fusain*, were accurately measured in several seams and the values shown graphically. The % found in certain seams are shown in a table. Generally analyses showed that vitrain contained the highest % of moisture and the lowest % of ash; clarain the highest % of volatile matter, less moisture and a slightly higher % of ash than vitrain; durain the lowest % of moisture and the largest % of ash; and fusain a higher % of ash and a considerably lower % of volatile matter than vitrain. Constituents from the same seam showed very marked variations not only in proximate and ultimate chem. analyses but also in their coking properties. Detns. of the agglutinating values, using electrode C under absolutely uniform conditions, showed that in this particular seam (Arley), clarain possessed the highest agglutinating value and durain marked coking properties. This factor is of importance in the light of the possible progress in the low-temp. carbonization of coal. Further work is necessary in order to ascertain the influence of a proportion of relatively non-coking durain or vitrain upon the coking properties of clarain. It is known that fusain modifies the coking properties of coal in which it occurs. In order to take full advantage of the different ingredients, it is clear that with certain seams not only must the coal be pulverized but also the ingredients must be intimately mixed so that the highly coking ingredient is disseminated evenly throughout the material. The properties of coal can best be ascertained by obtaining an accurate knowledge of the % of banded constituents in the seam, making a study of their properties, and computing the properties of the whole seam from the knowledge thus acquired.

J. L. WILEY

**Liberation of nitrogen and sulfur from coal and coke.** A. C. MONKHOUSE AND J. W. COBB. *Gas. World* 76, 542-8; *Gas J.* 158, 828-33(1922); cf. *C. A.* 16, 333.—The behavior of the N in coal and coke has been examd. under the influence of heat in an inert atm. (N), in H and in steam. Expts. were made with a soft coke (500°), a medium coke (800°) and a hard coke (1100°). By heating the soft coke in an inert

atm., N was liberated, but up to 800° only  $\frac{1}{3}$  of the N was obtained as  $\text{NH}_3$ , the rest being free. No appreciable amt. of  $\text{NH}_3$  was obtained above 700°, although above this temp. the coke continued to lose N. At 800° with the soft coke, an atm. of H, in addition to any preservative action in retarding the dissociation of  $\text{NH}_3$  once formed, exerted a specific action in liberating as  $\text{NH}_3$  a part of the N which would otherwise have remained in the coke. By prolonged treatment with H up to 1000° in stages 68.2% of the N of the coke was obtained as  $\text{NH}_3$ . With the medium coke the attack of H was less and the  $\text{NH}_3$  recoverable smaller. With the hard coke, the H had no power of attack up to 1000°. By gasification of the coke with steam, the whole of the N was obtained as  $\text{NH}_3$ , the liberation of  $\text{NH}_3$  being much more rapid (above 600°) than with H. The liberation of  $\text{H}_2\text{S}$  from 3 cokes prep'd. in the lab. at the above temps. from Yorkshire coal was studied, and it is believed that the nature of the coal used affects the  $\text{H}_2\text{S}$  results more than the  $\text{NH}_3$  results, because of the influence of S combined with inorg. elements such as Fe and Ca. Of 100 parts of S present in the coal, the % occurring in the soft and medium cokes were 56.4 and 50.1, resp. On heating in N very little  $\text{H}_2\text{S}$  was evolved up to 1000° and very little S lost from the cokes. On heating the soft coke in H,  $\text{H}_2\text{S}$  was evolved steadily up to 800° when it fell away in amt. Although the heating in H was prolonged to 40 hrs.,  $\text{H}_2\text{S}$  was still coming off steadily at each temp. when the evolution of  $\text{NH}_3$  had nearly ceased. At 900° the evolution of  $\text{H}_2\text{S}$  increased again in a manner which suggested attack on some comp'd. previously resistant. When the treatment ceased at 1000°, 93.8% of the S of the coke had been obtained as  $\text{H}_2\text{S}$ . No effect corresponding to the dissociation of  $\text{NH}_3$  was noticed. On heating in steam the loss of S was rapid but not more so than with H up to 800°. Completion of decompn. could, however, be secured in steam at that temp. when the attack of H had become negligible. Probably the S comp'd. was attacked by steam at 800°; this required a rise of temp. to 900° if H was employed. With both H and steam, and especially with a mixt. of the 2, the S in the 1100° coke was attacked vigorously at lower temps. such as 800°, at which the N comp'ds. were little affected.

J. L. WILEY

Insulation for fuel conservation. E. F. DAVIS. *Gas Age-Record* 49, 769-70, 772, 777-8; 50, 13-17(1922).—The advantages of furnace insulation are discussed. Cf. C. A. 15, 2613.

J. L. WILEY

Plastic fuel can be made of low-grade coal and oil and can be coked even if non-coking coal is used. GEO. H. DACY. *Coal Age* 21, 953-6(1922).—Wet pulverized low-grade fuels such as impure lignite, anthracite culm, waste from bituminous mines and the like, when treated with 30% to 40% as much oil as coal substance present agglomerates into a plastic mass in which the coal and the oils are intimately united. The ash remains suspended in the water and may easily be removed. The crudest and cheapest petroleum products are as efficient as the most highly refined. Even anthracite properly treated with oil yields a good coke. A commercial plant at Alexandria, Va., designed to handle 1000 tons of coal per day is described.

H. L. OLIN

Walloon coals. H. I. JENSEN. *Queensland Govt. Mining J.* Mar. 15, 1921, p. 93, and Oct. 15, 1921, p. 406; *Bull. Imp. Inst.* 19, 537-9(1921).—The deposits are Jurassic and upper and lower Permo-carboniferous and contain 5% moisture, 40.5% volatile matter, 49.7 fixed C and 4.8% ash. The coal has a calorific value of 11,164 B.t.u. and is non-coking. It is estd. that there are about 480,000,000 tons of coal in the area.

R. L. SIBLEY

Thermal calorific value. J. HUDLER. *Z. Ver. deut. Ing.* 66, 495-7(1922).—Comparative results of the calorific value of anthracite coal, coal briquets, brown coal, and peat are given with a discussion of losses in heating value due to moisture in the fuel.

C. T. WHITE

Detonation characteristics of blends of aromatic and paraffin hydrocarbons.

THOMAS MIDGLEY, JR. AND T. A. BOYD. *J. Ind. Eng. Chem.* **14**, 589-603(1922).—Knocking in automobile engines heretofore attributed to pre-ignition is probably due to a detonation of part of the fuel charge. Its tendency to detonate is a function of its chem. compn. For a fuel of given compn. and structure this tendency varies with the compression to which it is subjected, the effectiveness with which the engine is cooled and the degree of carbonization in its cylinders and it is influenced by some elements of design such as the location of the spark plug. It has been known that the addition of  $C_6H_6$ , and certain other aromatic hydrocarbons, to paraffin-base gasolines greatly reduced the tendency of the fuel to "knock." M. and B. have studied the effect of  $C_6H_6$ ,  $C_7H_8$  and  $C_8H_{10}$  in various concns. and find for a paraffin fuel that up to a concn. of 70% by mols. the effectiveness of  $C_6H_6$  for suppressing detonation varies directly as the square of its mol. concn.

CHARLES E. MUNROE

Automatic carbon dioxide indicator for flue gas. R. B. MACMULLIN. *J. Ind. Eng. Chem.* **14**, 628-9(1922).—A detailed description with a sketch, is given for constructing a continuous  $CO_2$  indicator. In principle it involves the maintenance of a const. pressure drop which causes a gas to be sucked into the app. and through a soln. of NaOH at a rate corresponding to zero  $CO_2$ . The flow increment caused by the absorption of  $CO_2$  if present is registered directly as percentage of that constituent.

H. L. OLIN

Benzene as a motor fuel. J. J. LAWTON. *J. Ind. Eng. Chem.* **14**, 635(1922).—The good qualities of benzene are expounded.

H. L. OLIN

Palm oil as a motor fuel. ANON. *Bull. Imp. Inst.* **19**, 515(1921).—Trials were carried out with a 50 h.p. semi-Diesel engine in which the only alteration was the addn. of an extra pipe to the filter connected to the tank in which the palm oil was situated. This tank was heated by a burner to liquefy the oil. No trouble was experienced but at 300 r.p.m., the power was reduced from 50 to 44.1 h.p. because of the lower calorific value of palm oil. Fuel consumption was 0.671 lbs. per b.h.p. hour. After a run of 6 hrs. the piston and cylinder were free from carbonaceous deposit.

R. L. S.

New methods of investigating lignite. R. PONTONÉ. *Braunkohle* **21**, 33-6, 53-7 (1922).—A discussion of the newer methods of detg. the geology of lignites by means of their amber, cellulose and floral incrustations (cf. Pontoné, *Jahrb. Preuss. Geol. Landesanstalt Berlin* **12**, Part 2, 132(1920)). A bibliography serves as a basis for a historical treatment of the following topics: (1) occurrence of amber in lignite; (2) technic of prepg. and investigating samples; (3) chlorodihydroxyacetic acid, the new maceration liquid; (4) amber inclusions in vegetable structures still completely preserved and (5) the d. of unweathered amber.

C. C. DAVIS

Lignite drying and dust fuel. WEISS. *Braunkohle* **21**, 79-85(1922).—An illustrated description of the Buttner system (German Patent) installed at Büttner Werken A. G. at Ürdingen for pre-drying lignite by means of fire gases. Drum driers now handle approx. 300 tons of wet lignite and reduce in 24 hrs. the  $H_2O$  content from 60 to 15%, giving a dust fuel. In expts. with air preheated to 150-60°, this lignite dust gave a flame temp. of 1720°. With air not preheated the  $CO_2$  and O contents with a flame at 1565° were 18.5 and 1.6%, resp.

C. C. DAVIS

Peat in 1921. K. W. COTTRELL. U. S. GEOL. SURVEY, *Mineral Resources of U. S.* **1921**, Part II, 13-4(preprint No. 3, published June 6, 1922).

E. H.

Investigation of aeration in atmospheric burners. J. W. COBB. *Gas World* **76**, 528-9; *Gas J.* **158**, 799(1922).—A progress report. The injector action has been studied in its simplest form, and the effect of factors such as varying pressure, density and compn. of gas, length and inclination of the tube upon its performance. The 2 usual theories of injector action; that the total momentum of the mixt. is the same as that of the gas alone, and that the kinetic energy is the same, were proved untenable even with the



introduction of a const. The theory suggested by the Am. Bur. of Standards that there is a const. ratio between the momentum of the gas jet and that of the air-gas mixt. issuing from the burner has found to hold approx. for high, but not for low velocities. The only positive result so far obtained was that the aeration increased when either the gas pressure or density increased and whether the expts. were made at equal gas ratio or at equal pressures.

J. L. WILEY

**Some boiler-firing troubles.** EDW. INGHAM. *Colliery Guardian* 123, 1417(1922).—Recommendations are made for overcoming black smoke, cinder in the exhaust gases, explosive mixts. in the flue, down drafts, boiler vibration and drop in steam pressure with coal as fuel.

C. C. DAVIS

**Increasing the rate of carbonization.** GEOFFREY WEYMAN. *Gas World* 76, 565-71; *Gas J.* 158, 864-70(1922); cf. *C. A.* 16, 630.—The rate at which coal is carbonized is fundamental to the economics of gas production, labor and maintenance charges and capital cost being reduced almost in proportion to an increase in rate. Expts. carried out in a coal-testing app. on a scale of 0.001 ton and in a retort of nickel chrome steel are described and the conclusions derived therefrom are given. An increase in the rate of carbonization caused by alteration in the chem. and physical conditions, due, for example, to the use of a more suitable type or size of coal, is accompanied by an improvement in the calorific value of the gas and of the thermal and vol. yields per ton. Very considerable increase in the rate of carbonization may be obtained by selecting those coals which give up their gas above a certain min. rate. Except in the case of oxidized coals, the calorific value of the gas, and consequently the thermal yields, are higher for an increased rate. When the increased rate of carbonization is caused by an increase in carbonizing temp. the results are complicated by the fact that the portion of the gas evolved on the outside of the plastic layer in the retort is subjected to increased degradation, and this effect opposes the tendency of the higher rate to give a gas of greater calorific value. Up to the end of a certain time, the calorific value of the higher-temp. gas is less than that of the lower-temp. gas, but vol. for vol. there is a slight balance in favor of the former. After a certain period, when the coal at a high temp. is nearly carbonized, the calorific value falls off very rapidly, while the coal at a low temp. is still producing gas of moderate quality. Increases in vol. and thermal yields per ton follow an increase in rate due to a higher carbonizing temp., which increases are impossible to obtain at a lower temp. Vol. for vol. the calorific value of the higher-temp. gas falls off at a slightly greater rate than that of the lower-temp. gas, but a greater vol. of gas is evolved in high-temp. carbonization, thus making up for the deficiency.

J. L. WILEY

**Report of the Refractory Materials Research Committee.** A. E. BROADBERRY, *et al.*, *Gas World* 76, 553-9; *Gas J.* 158, 840-52(1922); cf. *C. A.* 15, 3377.—Reference is made to the need for improvement of the after-contraction or expansion test as found in the Gas Institution's standard specification for refractory materials of Nov. 1912. In regard to the retort specification (cf. *C. A.* 14, 2411), it had originally been intended to make the retorts only from fireclay with admixture of grog, but it was now necessary to add Si and siliceous materials, aluminous materials, carborundum, etc., as well as mixts. of them. A new definition of what constitutes *signs of fusion* was suggested as being that condition "when the angular edges of the test piece begin to lose their angularity when heated under conditions stated." The contraction test had also proved difficult to carry out, the size specified being too large (4.5 in. sq.). It was now proposed to use smaller test pieces (3.5 x 1.5 to 2 x 1.5 to 2) and to place them vertically instead of horizontally. An endeavor is being made to overcome the difficulty experienced in taking the necessary measurements by allowing a tolerance of 1% for exptl. errors, but the actual allowance for contraction or expansion has been reduced from 1.25% to

1%. Standardization of the after-contraction test. D. A. JONES. *Gas World* 76, 554; *Gas J.* 158, 840-4; cf. *C. A.* 16, 808. Thermal conductivity of refractory materials at high temperatures. A. T. GREEN. *Gas World* 76, 554-8; 77, No. 1980, (Coking Sec.), 13-18; *Gas J.* 158, 844-51.—The report is unsuitable for abstracting; the results being expressed mostly in tabular form. Previous work on the subject is reviewed. As regards the relationship between porosity and thermal cond., results of the expts., suggest that at high temps. (1400-1500°) some of the pore spaces lose their insulating properties, and even at 1100° have the capacity for transmitting heat at rates comparable with the solid matter. Diffusivity is indicated as being the measure of the rate of rise of temp. produced in a material. It varies with temp. in a manner similar to that of thermal cond., and in carbonizing its measurement would form a satisfactory criterion of the thermal efficiency of the material, while in furnace work where insulation is desirable, the measurement of thermal cond. would be more satisfactory.

J. L. WILEY

Determination of benzene in gas. A. KRIEGER. *Chem.-Ztg.* 46, 468-9 (1922).—A miscellany. Many errors have been made in the paraffin oil absorption method for detg. benzene because too little oil has been used. In the charcoal absorption method, the steam distn. should be conducted at 180° in an air bath, and 300 cc. of condensate collected. The method is as accurate as that with paraffin oil, and is more convenient. It might be applied for com. benzene recovery. Some properties of the recovered benzene are given. The practice of washing motor benzene with  $H_2SO_4$  is wasteful. A method of testing absorbent oils is to pass samples of the same gas through wash bottles contg. the oil to be tested and a known oil, and noting the point at which differences in wt. gained appear. Cf. *C. A.* 15, 2981.

ERNEST W. THIRLE

(Investigation of a carbureted-water-gas plant with waste heat boiler.) Seventh report of the Research Sub-Committee of the Gas Investigation Committee of the Institution of Gas Engineers. ARTHUR SMITHHELLS *et al.*, *Gas World* 76, 520-42; *Gas J.* 158, 800-27 (1922); cf. *C. A.* 15, 2709.—The investigations were carried out at the Birmingham Gas Works with the object of detg. the efficiency of the production of carbureted water gas of a calorific value of about 485 B.t.u. gross per cu. ft., but since the installation included waste-heat boilers, data were obtained showing the amt. of steam raised and the resulting increase in thermal efficiency of the whole process. This amounted to an av. of 68%, as compared with 59.5% if the steam was raised independently. The efficiency of production of oil gas was approx. 90%, which has raised the efficiency of the whole process to 68%, although the blue water gas was produced at an efficiency of only 53%. The overall efficiency of production of carbureted water gas is thus dependent on the amt. of oil gas mixed with the blue water gas. The thermal balances of the waste-heat boilers show that the total heat of the steam raised was only 41.9% of the heat entering the boiler in the first test and 49.6% and 43.4% in 2 subsequent tests. The amt. of steam raised in the first test was sufficient to supply the generators and to drive the blower and auxiliary plant. The plant is illustrated and described and the methods of operating and testing are given in detail. J. L. W.

Report of Life of Gas Meters Joint Committee. B. R. PARKINSON. *Gas World* 76, 548-53; *Gas J.* 158, 834-9 (1922).—The question of internal corrosion in relation to modern gas practice is affected by the change from the use of lime to oxide for purification, the latter leaving a larger proportion of  $CO_2$  and HCN in the gas than the former. A somewhat increased proportion of  $CS_2$  was also allowed to go forward with oxide purification, and this, by interaction with any  $NH_3$  present, produced most destructive salts. The principal remedy was the removal of HCN by the chalk process, and with regard to S compds., since these are harmful only in presence of  $NH_3$ , attention should be given to the efficiency of the  $NH_3$ -washing plant. Corrosive effects

were aggravated by the decompn. of hydrocarbons which otherwise formed natural lubricants and preservatives of the distribution system. This absence of rich hydrocarbons in coal gas could be made up by carbureting of water gas. Aq. vapor in the gas has been given greater freedom of action by the absence of oily constituents, and might act either as a vehicle for corrosive salts or as a simple aid to corrosion in conjunction with O and CO<sub>2</sub>. Paraffin vaporization is prescribed as a remedy, or palliative, for corrosion and naphthalene troubles, but a gas satd. with water will not hold much paraffin vapor. (Cf. Swindin, *C. A.* 15, 3384.) A table shows the amt. of aq. vapor in satd. gas at various temps. and pressures. O in the gas has added another corrosive agent. Its harmful action on the leathers of dry meters is not sufficiently realized. The *chalk process for extn. of HCN* as invented by J. G. Taplay is described (cf. *C. A.* 15, 3736). Either solid chalk can be used in a scrubber or cream of chalk and water in a washer. The unit should lie between the tar extractor and the NH<sub>3</sub> washer, for it is essential to the reactions that the gas should contain NH<sub>3</sub>, but should be free from tar. If a scrubber is used, the solid chalk should be broken into lumps varying in size according to the plant, and this chalk washed periodically with clean water or weak liquor. The product, which is NH<sub>4</sub>CNS, must be removed as formed. The chalk merely acts as a contact agent; the real agent for the absorption is the Ca(HCO<sub>3</sub>)<sub>2</sub> or Mg(HCO<sub>3</sub>)<sub>2</sub> which it may contain. Alternatively, the gas is passed through an aq. soln. of Ca(HCO<sub>3</sub>)<sub>2</sub>; the reaction is cyclic and can be carried out as a continuous operation. A plant to treat 2.5 million cu. ft. per 24 hrs. is now being installed at the Bow Common gas works. Other topics dealt with are the sp. cases of corrosion investigated during the yr., the effect of vaporizing petroleum on the stuffing-boxes of meters, the maintenance of pre-payment meters, and standard sizes of gas mete ..

J. L. WILEY

**Recording and integrating gas calorimeter.** C. V. Boys. *Gas World* 76, 581-6; *Gas J.* 158, 882-8(1922).—The instrument, designed by B. to meet the requirements of the Gas Regulation Act, is of the usual water-flow type, both water and gas being passed through it positively at the correct rate, the correction for gas vol., as affected by the temp., pressure and contained water vapor, being also effected by a positive operation. The gas flow is kept at a definite rate of 0.5 cu. ft. per hr., and the amt. of water passing is regulated so that its temp. will be raised 10° by the combustion of the gas if the latter is of the declared calorific value. The water is measured by an eccentric bucket and the waste water which is discharged when the bucket is tilted runs over a small overshot water wheel which supplies the motive power for driving the escape-ment of a clock. It also drives the gas-measuring device through an ingenious continuously variable gear which controls the speed of operation according to the value of the gas vol. at the time. The gas-measuring device is in the form of a rotating drum constructed of celluloid and arranged so that the greater part of its wt. is supported by water. The amt. of gas passed is independent of the water level. The heat of combustion is transferred to the water in a heat interchanger constructed of thin sheet Pb in order to resist the acid products of combustion, and the two thermometers, which measure the increase in temp. of the water, are composed of brass tubes filled with amyl alc. and closed at one end by thin corrugated metal lids. The thermometers are completely immersed in the hot or cold water, and the expansion of the alc., which produces a movement of the metal lids, operates the integrating and recording mechanism through a system of magnifying levers. Heat insulation is effected by surrounding the hot water compartment by a jacket of almost the same temp. as itself, a small part at the lower end having a jacket at a somewhat higher temp. There is thus scarcely any radiation or other loss of heat from the hot-water compartment and there is a gain in the lower portion equal in amt. to the very small loss. The object of the integrating device

provided in addition to the recording pen is to show the extent to which the calorific value of the whole amt. of gas passed in a given period has been greater or less than the declared value. The water used in the instrument is stored in 2 tanks holding about 10 gal. each, and is continuously circulated by a pump driven by a hot-air engine, so that any objection to water constantly running to waste is avoided. J. L. WILEY

**Recording calorific value of gas. The Fairweather recording calorimeter.** ANON. *Gas World* 77, 12-13(1922).—This instrument has been provisionally prescribed by the Gas Referees for producing continuous records at the Brentford Gas Plant. This calorimeter comprizes, briefly, a water-flow calorimeter of the Boys type, adapted to record continuously the total heat value of the gas, reduced to standard temp. and pressure. This automatic and continuous operation is effected by combining with the calorimeter proper the following automatic devices: Means for supplying to the calorimeter a definite and measured water flow; means for automatically adjusting such flow to compensate for the effect of temp. and pressure conditions of the gas: a time-controlled wet meter adapted to supply gas uniformly to the calorimeter at a const. rate; a recording thermometer adapted to indicate the temp. rise imparted to the water passing through the calorimeter. This temp. rise is a direct measure of the calorific value of the gas and is converted into B. t. u. by appropriate ruling of the record sheet. Details are given by reference to a diagram. J. L. WILEY

**The gasification of crude Rhenish lignite and its course of action when pre-dried lignite is used.** GEORG MÜLLER. *Braunkohle* 21, 1-10; 49-53(1922); *Dissertation* Berlin.—After an outline of the important properties of Rhenish lignite together with the well established laws of gasification, a critical discussion follows of the expts. of Weiss and Becker (cf. *C. A.* 16, 814; *Stahl und Eisen* 40, 1068(1920)). New expts. show that the direct current is the most suitable and efficient drying process for large-scale practice, since it permits higher temps. than the counter-current process. If bitumen loss is to be avoided, the initial temp. should be approx. 250°. The O content of the drying gas must be not over 3% to prevent oxidation. The employment of a pre-drying process depends on the relative market for gas and for tar and on the quality of gas desired. By pre-drying to 40% moisture, the calorific value of the gas became as high as that of briquet gas. Further drying gave no further increase in B. t. u., but the yield and quality of tar improved with the extent of the pre-drying. For a gas of low calorific value a pre-drying process is not advantageous, but the use of screened lignite is advised. For gas of high calorific value a pre-drying to approx. 40% moisture is requisite. If low-temp. tar is desired the pre-drying must be carried still further. C. C. DAVIS

**Selection of coal for the Tully plant.** C. B. TULLY. *Gas J.* 158, 623-4(1922).—With the Tully plant good results can be obtained with a second-grade coal. Its selection depends more upon its gas-producing than upon its coke-producing qualities. The amt. of ash does not matter as long as it is non-fusible. It is better to avoid a highly bituminous coking coal, on account of its liability to stick and form a pasty mass in the generator, and generally to cause difficulty with clinker. J. L. WILEY

**Increasing water gas set capacity.** W. E. STEINWEDELL. *Gas Age-Record* 50, 3-4, 19(1922).—A method is described of increasing capacity by the expedient of enlarging generating capacity, either by adding a generator or by increasing the size of the one already in use, using the same carbureting and superheating equipment. J. L. WILEY

**Glover-West verticals at Vancouver.** E. G. BLACKWELL. *Gas Age-Record* 50, 7-9(1922).—Details of construction and operation are given. J. L. WILEY

**Institution of Gas Engineers, Fifty-Ninth Annual Meeting, Presidential Address.** THOMAS HARDIE. *Gas World* 76, 522-7; *Gas J.* 158, 794-8(1922).—A paper of general

interest to the gas indus. touching upon various phases of gas engineering. J. L. W.

Reconstruction problems at Beckton. W. B. LEBCH. *Gas World* 76, 571-81; *Gas. J.* 158, 871-81(1922).—Details are given of work done and reasons therefor in reconstructing and extending gas plant and auxiliaries. J. L. WILBY

Stoppage of the condenser in the distillation of coal tar. W. SPALTENHOLZ. *Chem.-Ztg.* 46, 544(1922).—A stoppage caused by  $\text{NH}_4\text{Cl}$  is described. It can be prevented by introduction of a small amt. of moist steam during the naphthalene period and the beginning of the anthracene period. E. H.

The micro-structure of coke. ANON. *Colliery Guardian* 123, 1355-6(1922).—The report of the British Fuel Research Board for 1920-1 on low-temp. coking tests is reviewed, with a discussion of recent progress. C. C. DAVIS

The behavior of amorphous carbon and sulfur when heated (WIBAUT) 6.

Gas manufacture. G. HALPS. *Brit.* 166,212, March 29, 1919. A gaseous mixt. of a calorific value of about 150-240 B. t. u. per cu. ft. comprises gas made from coal, peat, wood, or the like, and either dilg. or enriching agents. The mixt. may be distributed, and when desired all or part of it may be carbureted or mixed with rich gas locally. The mixt. may be made by mixing rich coal gas with blue water gas, Mond gas, or other low-grade gas, or air or  $\text{N}_2$ , or it may be made in a gas producer or by the processes described in 111,495 (*C. A.* 12, 992), and 156,812. The piping of a house may be so arranged that all the gas is carbureted or so that only part is carbureted for particular purposes. Coal gas or oil gas may be made on the consumer's premises as part of the mixt.

Liquid fuel mixture. A. A. BACKHAUS. U. S. 1,419,910, June 20. A fuel mixt. adapted for use in internal-combustion engines is formed of a petroleum distillate such as kerosene and gasoline,  $\text{MeOH}$  and  $\text{EtOH}$ , and aromatic hydrocarbon, *e. g.*,  $\text{C}_6\text{H}_6$  or toluene, and a phenolic blending agent, *e. g.*, cresol, with or without  $\text{PhNO}_2$ . Cf. *C. A.* 16, 1499.

Internal-combustion engine fuel. M. C. WHITAKER. U. S. 1,420,006, June 20. A mixed fuel is formed of diethyl ketone 35, alc. 25,  $\text{EtOAc}$  5, gasoline 17.5 and kerosene 17.5 parts. U. S. 1,420,007 relates to a fuel mixt. composed of alc. 40,  $\text{C}_6\text{H}_6$  30 and  $\text{EtOAc}$  30 parts.

Agitating fuel in gas producers. H. F. SMITH. U. S. 1,417,637, May 30. Explosive force from explosion of a gaseous mixt. is applied to the charge within a producer, from the under side of the ash zone, to agitate the fuel.

Froth-flotation of coal. E. EDSER, H. L. SULMAN and F. B. JONES. U. S. 1,418,547, June 6. Impure coal contg. good coal, bone coal and gang is subjected to froth flotation to obtain a concentrate rich in pure coal and the remaining pulp is subjected to further froth flotation with cresol and kerosene to obtain a concentrate high in bone coal. Cf. *C. A.* 15, 2173.

Coking coal. F. PUENING. U. S. 1,419,908, June 13. Coal is coked while held under pressure between hollow metal devices one at least of which is movable, and the coal is heated exclusively through these metal compression devices by maintaining combustion of gas within them.

Cupola coal, oil and water gas generator. S. MOORE. U. S. 1,418,158, May 30.

Coal gas. A. F. KERSTING. U. S. 1,420,041, June 20. A series of retorts is charged in sequence with coal and volatilized products from each freshly charged retort are led off through another retort contg. more highly carbonized coal, and, later, directly through a take-off conduit.

**Electric furnace adapted for heating coal samples.** F. W. SPERR, JR. and H. J. ROSE. U. S. 1,418,984, June 6.

**Gas from heavy oil.** O. B. EVANS and H. C. TERZIAN. U. S. 1,418,782, June 6. Heavy oil is gasified by introducing it into preheated checkerwork and the C deposit which is thus formed on the checkerwork is consumed by blasting it with preheated air.

**Producer gas.** H. F. SMITH. U. S. 1,417,636, May 30. The body portion of fuel in a producer is blasted with air and at the same time sufficient steam or CO<sub>2</sub> is passed through the portion of the fuel next the producer wall to protect the latter from destructive action of the charge.

**Retort for gas-producers.** S. F. SWORSKI and F. F. RATAJCZAK. U. S. 1,418,745, June 6.

**Poker for gas producers.** E. H. WILSON. U. S. 1,419,342, June 13.

**Distilling tar.** J. M. WEISS. U. S. 1,418,893, June 6. N is circulated through hot tar at a rate of 1-20 cu. ft. per 100 gals. of tar per min. until a pitch is obtained m. about 175°.

## 22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

**International aspects of the petroleum industry.** V. H. MANNING. *Trans. Am. Inst. Mining Met. Eng.* 65, 78-88(1921).—An address. Other sources of supply must be sought to make up the balance between domestic production and domestic needs. This will require not only an extension of our activity in foreign fields, but a study of the utilization of shale and substitutes of petroleum. R. L. S.

**Production, marine transportation and taxation of Mexican petroleum.** V. R. GARFAS. *Trans. Am. Inst. Mining Met. Eng.* 65, 528-67(1921).—Statistical article, mainly from 1917 to 1921 inclusive. Also includes an analysis of Mexican taxation on petroleum. R. L. SIBLEY

**Petroleum industry of Trinidad.** G. A. MACREADY. *Trans. Am. Inst. Mining Met. Eng.* 65, 68-68(1921).—All petroleum produced by Trinidad has been yielded by strata of Tertiary age. The most important portion of the Tertiary strata consists of sandstone and shale which grades upward into marl and shale contg. marine org. matter and evidences of petroleum. The org. matter is probably the primary or "mother" source from which Trinidad petroleum is derived. The geol. formations are tabulated in detail. The formations are enriched by oil migrating from the underlying org. shales. Where the shales lie close below as a result of Tertiary erosion and the sands are not too thick or too clayey at the base, satn. may be sufficient for com. production. Where the sand is too thick and petroleum has migrated slowly, satn. may not be sufficient for commercial production. The petroleum varies greatly in sp. gr. even in the same field. It is, with one exception, of asphaltic base. The av. sp. grs. from different fields are 17°, 14°, 16°, 18°, 20°, 22° and 43° Bé. R. L. SIBLEY

**The surface tension of petroleum.** C. K. FRANCIS and H. T. BENNETT. *J. Ind. Eng. Chem.* 14, 626-8(1922).—The surface tensions of several petroleum and petroleum products were detd. by the du Nouvy method. Surface tension increases with increase in sp. gr. or viscosity, but is little affected by the presence of amorphous or cryst. paraffin wax. Surface tension decreases about 0.05 dynes per cm. for each 1° F. increase in temp. E. H. LESLIE

**Refractometric examination of petroleum and petroleum products.** UTZ. *Petroleum Z.* 17, 1293-9(1921).—The refractive index increases with the b. p. in the case of

liquid products and with the m. p. in the case of mineral waxes. American crude oils may be distinguished from European crudes by the refractive indices of certain fractions, but the various European crudes cannot be distinguished from each other.

R. L. SIBLEY

**Petroleum colorimetry.** P. D. BARTON. *Nat. Petroleum News* 14, No. 22, 53-4 (1922).—Consideration of the importance of accurate color detn. and a description and criticism of the Lovibond, Saybolt and Union Petroleum colorimeters.

R. L. SIBLEY

**The manufacture of petroleum products.** G. A. BURRELL. *Oil Gas J.* 20, No. 50, 14, 115-121(1922).—Consideration of various cracking processes yields of various distillates from Ranger, Mexia and Mexican crudes are given for the various processes of skimming, cracking, coking, etc.

R. L. SIBLEY

**The production of gasoline by cracking heavier oils.** E. W. DEAN AND W. A. JACOBS U. S. Bur. of Mines, *Tech. Paper* No. 258 (1922).—A brief comparison of vapor-phase and liquid-phase cracking processes is given. Expts. were undertaken to show the influence of temp., pressure, and rate of feed of oil on the thermal decompn. of Pennsylvania, Mid-Continent, and California gas or fuel oils. The app. consisted of a 3-foot extra heavy Fe pipe  $1\frac{1}{2}$ -in. in internal diam., and heated by a resistance wire wound spirally about the pipe. Temps. were measured by means of a thermocouple whose wires were threaded into taps in the Fe pipe and then peened to ensure contact. The probable error in temp. measurements was less than  $1^{\circ}$ . The oils were fed by a rebuilt one-quart Powell "Captain" lubricator. The feed rate varied as much as 10% from the desired mean. The vol., sp. gr., and unsatn. of the cracked oils were detd. This oil was also distd., and the sp. gr. and unsatn. of some fractions detd. The distillate below  $150^{\circ}$  was arbitrarily called gasoline, and comparisons of the results of the runs were made on the basis of the quantity and properties of this cut. **Conclusions.**—Cracking is a contact-surface reaction, as the controlling temp. is that of the furnace walls rather than that of the oil vapor. The range of temp. suitable for cracking any given oil is less than  $50^{\circ}$ . Different oils require different temps. if best results are to be obtained. With the app. used temps. higher than  $500^{\circ}$  were necessary for extensive cracking. Pressure affects the reactions favorably up to 200 lbs. gage, which was the highest pressure used. Pressures of 100 lbs. are sufficient to afford most of the advantage to be gained by the use of pressure. The amt. of C formed is largely controlled by the amt. of asphalt in the oil used. C deposition is not serious if a clean distillate is used as raw material, and if operating conditions are carefully controlled. As much as 28% of gasoline of  $430^{\circ}$  F. end-point can be produced by vapor-phase cracking, although it is improbable that this yield would be profitably obtained in com. practice because of the attendant large loss in the form of gas and C. A com. yield of 20 to 25% is reasonable, and should not involve a loss greater than 15%. The gasoline produced by vapor-phase cracking has a degree of unsatn. of 25 to 40%. The higher boiling fractions contain less olefins than the lower-boiling ones. The high sp. gr. of some of the cracked products indicates that they contain aromatic hydrocarbons. The residuum from once cracked oil is not as good a raw material for cracking as the original oil. Heavy fuel-oils and residuum are not suitable materials for vapor-phase cracking because of the large C deposition. Some distillate-oils crack better than others, but none was tried that did not prove satisfactory. Losses incident to the formation of a given percentage gasoline were smaller when the temp. and rate of feed were relatively high than when these were lower. This is the opposite of what would be expected on the basis of previous experience. A brief *bibliography on cracking* is given.

E. H. LESLER

**Methods for recovering gasoline from uncondensed still vapors.** D. B. DOW. *Nat. Petroleum News* 14, No. 22, 28-31, 14, No. 23, 87, 89, 90, 93(1922).—Uncondensed

vapors from the condenser are classed as "sweet gas" if obtained from distn. of the lighter ends of a crude oil and "sour gas" if obtained from cracking. The sour gas is highly unsatd. and often contains much S. The amt. and nature of gas found depends on the distn. process used. In skimming plants nearly all the gas is formed during distn. of the first 15% of the crude. No scrubbing is needed, as little S is present. This gas usually passes under its own pressure into a 6" header where 7-30 gals. of gasoline per 1000 cu. ft. gas are recovered by condensation. The problem of recovery is more difficult in pressure-still gas, because of the necessity of maintaining the pressure const. S must be removed also. Factors detg. gasoline content of uncondensed vapors are the nature of the still charge, temp. of the stream and vacuum carried on run down lines. The following figures give, resp. the no. of cu. ft. of gas obtained per bbl. and the no. of gal. of gasoline recoverable from 100 cu. ft. of gas: Mexican crude 200, 4; Mid-continent crude 80, 7; av. slop 120, 5; gas oil 140, 3.5. Compression and cooling or absorption methods or combinations of the two are most often used for gasoline recovery. Naphtha is a much better absorbent than gas oil, inasmuch as the mixt. can be pumped directly into the storage tanks. Also in Bur. Mines, *Repts. Investigations* 1922, No. 2344, 26 pp.

R. L. SIBLEY

Use of calorized tubes in oil refining. A. V. FARR. *Nat. Petroleum News* 14, No. 22, 83, 85(1922).—Where temps. above 750° F. are reached, calorized tubes resist the heat action and corrosion. C deposits are decreased to about one third. Other gases such as SO<sub>2</sub>, CO and CO<sub>2</sub> do not affect the tubes.

R. L. SIBLEY

Double-run-back line would save loss to the small refiner. K. M. DOAN. *Nat. Petroleum News* 14, No. 23, 43-4, 47-8(1922).—Absolute sepn. of the overhead distillates should be accomplished. Because of the fact that sepn. of a lighter hydrocarbon from the heavier one in a mixture of their vapors does not take place immediately, two or more connections in the run down line are necessary for complete sepn. This does away with the necessity of redistn. and would save 8500 bbls. annually on a total throughput of 1100 bbls. daily.

R. L. SIBLEY

Oil shale. H. I. JENSEN. *Queensland Govt. Mining J.* Mar. 1921, p. 92, Oct. 1921, p. 401; *Bull. Imp. Inst* 19, 548-9(1921).—The Walloon area (Jurassic) appears to contain numerous seams of kerosene shale or torbanite, some yielding 44.8 gals. to the ton. Another sample of kerosene shale yielded 54 gals. of oil per ton.

R. L. S.

The oil shale of Esthonia. E. H. CUNNINGHAM-CRAIG. *Engineering* 113, 624 (1922).—Lecture before the Institute of Petroleum Technologists on the oil shale of Esthonia. Esthonia shale (also known as kukersite) is the oldest and the richest shale that is being worked, except for torbanites, which are frequently classed with canal coal. The oil shales up to eight ft. thick are quarried in open workings. The layers of shale are sepd. by bands of limestone, which is crumbly much like sandstone. About 50% of the so-called shale is calcite debris of fossil trilobites and brachiopods. This shale is believed to be an example of inspissated petroleum absorbed by colloidal inorg. matter. As high as 90 gals. of petroleum was obtained from a ton of this shale. The probable future of the oil-shale industry is discussed.

R. T. GOODWIN

Oil shales and petroleum prospects in Brazil. H. E. WILLIAMS. *Trans. Am. Inst. Mining Met. Eng.* 65, 69-77(1921).—Samples of oil shales from central Maranhão gave the following results on analysis: bitumen 36.5%, clays 22.8% sol. carbonates 40.8%, and on slow distn. about 100 gal. oil per ton shale. Samples of shale from parts in the Alagôas district contd. from 7.8 to 46.3% volatile combustible and 34.2 to 89.3% ash (series of 10 determinations). One sample contd. 4.7% S and upon distn. yielded 44.73 gal. oil and 19.58 gal. ammoniacal water per ton shale. In Bahia, the boghead coal known as the "Turfa de Marahú" is found. The great mass of the rock is composed of yellowish, brownish humic material. An analysis gave: H<sub>2</sub>O 2.75%, volatile matter



71.65%, non-volatile combustible matter 9.75%, mineral residue 15.85%.

R. L. SIBLEY

Apparatus for investigating paraffins, pitches, asphalts, etc. (ANON.) 1. Drying oils from petroleum and other products (GARDNER, BIELOUSS) 26. Apparatus for reactions at high temperatures under pressure (U. S. pat. 1,417,585) 1. Oxidizing olefins (U. S. pat. 1,418,368) 10.

Cracking petroleum oil. R. W. HANNA. U. S. 1,419,378, June 13. Oils such as crude oil or oils of high b.p. are distd. under less than atm. pressure to avoid decompn. of the oil and a relatively high boiling distillate is then subjected to a temp. and pressure sufficient to effect cracking.

Cracking hydrocarbon oils. W. F. RITTMANN. U. S. 1,419,121, June 6. Gasoline hydrocarbons are obtained by vaporizing oil of a higher b. p. and passing the uniform mixed vapors through a vertical cracking chamber in which the vapors are exposed to a temp. of 500-700° and a pressure preferably in excess of 300 lbs. per sq. in. U. S. 1,419,122 relates to a similar process in which the liquid hydrocarbon is preliminarily heated to a cracking temp. and then discharged into a vaporizing and cracking retort for further production of low boiling products. U. S. 1,419,123 relates to subjection of the hydrocarbon vapors to temps. of 650-800° and pressures of about 250 lbs. per sq. in. to effect production of high yields of aromatic hydrocarbons. U. S. 1,419,124 relates to producing aromatic hydrocarbons of lower b. p. such as  $C_6H_6$  and toluene from xylene or similar aromatic hydrocarbons of higher b. p. by subjecting the vapors to temps. of 600-900° at low pressures, *e. g.*, a half atm. pressure. U. S. 1,419, 125 relates to superficial heating of a liquid body of oil to derive vapors for cracking without heating the principal bulk of the liquid oil. A vertical retort is described a portion of which is filled with oil; the upper part of this is exposed to heat from a furnace surrounding a portion of the retort.

Cracking hydrocarbon oils under pressure. A. A. WELLS. U. S. 1,418,414, June 6. Hydrocarbon oils are cracked under pressure with formation of tarry still bottoms, the still bottoms are subjected to distn. and the distillate is re-cracked under a pressure lower by at least 1 atm. than the pressure originally employed, in order to obtain a product rich in olefins adapted for extn. with  $H_2SO_4$  without undue rise in temp.

Cracking oils. G. L. HOYTE. U. S. 1,418,713, June 6. A relatively small amt. of hydrocarbon oil is heated to a cracking temp. and is then mixed with a larger amt. of oil at a lower temp. to effect distn. of light hydrocarbons.

Separating and topping hydrocarbons from aqueous mixtures. W. A. BROWN. U. S. 1,419,610, June 13. Mixts. such as emulsions contg. hydrocarbons and  $H_2O$  are first heated under pressure such as to prevent evapn. of  $H_2O$  while permitting sepn. of the hydrocarbons and the hydrocarbons are then further heated without substantially heating the  $H_2O$  to develop hydrocarbon vapors. An increased pressure is simultaneously held on the liquids and some of the vapors are withdrawn as the  $H_2O$  settles out of the mixt.

Fractional condensation of hydrocarbons or similar substances. J. F. W. SCHULZE. U. S. 1,418,885, June 6. A fraction of mixed vapor is condensed and concd. by heat interchange and dephlegmation with the vapors generated from the fraction by reheating it to a higher temp. than that at which it was in equil. with the mixed vapors, by indirect heat transfer from the mixed vapors.

Treating oil-bearing sand. G. SCHNEIDERS. U. S. 1,418,098, May 30. Deposits of oil-bearing sand are subjected to the action of a jet of hot  $H_2O$  or saline soln. which

simultaneously effects removal of sand from the deposit and dissoc. of the bitumen from the sand.

Scrubbing apparatus for recovering gasoline from casinghead gas. W. R. McGINNIS. U. S. 1,418,876, June 6.

Separating petroleum-oil sludges. S. H. DIGGS. U. S. 1,418,781, June 6. The sludge, such as that obtained by petroleum oils with  $H_2SO_4$  is mixed with  $H_2O$  and mineral oil sludge sulfonic acids, heated and permitted to stratify, to obtain asphaltic products.

Apparatus for fractionating petroleum oils or residuums. L. CLARK. U. S. 1,418,621, June 6.

Apparatus for treating petroleum vapors with molten metal. D. W. HOGE. U. S. 1,418,375, June 6.

Turpentine still. S. E. OLIVER. U. S. 1,419,894, June 13. The still has a condensing dome cooled by spraying  $H_2O$  in its top. At the lower edge of the dome there is an exterior gutter for carrying off the cooling  $H_2O$  and an inner gutter for collecting the distd. turpentine or other distd. liquid.

Oil heater for topping stills. J. E. BELL. U. S. 1,418,272, June 6.

## 23—CELLULOSE AND PAPER

CLARENCE J. WEST

Preparation and characterization of an alkali-soluble cellulose. EMIL KNOEVEN-AGEL AND HERWIG BUSCH. *Cellulosechem.* 3, 42-60(1922).—The hydrolysis of viscose cellulose leads to the formation of a modified cellulose or hydrocellulose which, even after drying, is sol. in cold 8% NaOH. The hydrolysis may be carried out by Girard's method (by steeping in 3% HCl, pressing out till wt. of acid is equal to that of the cellulose, drying in the air and heating in a closed vessel at  $70^\circ$  for 4 hrs.) or by Lederer's method (with 98% AcOH contg. 0.25% HCl). Probably the most convenient method consists in the use of gaseous HCl. The % of acid absorbed corresponds with the quantity of moisture present and by regulating this factor as well as time and temp. of the reaction it is possible to obtain a product which is completely sol. in 8 % NaOH. If the viscose contains 11%  $H_2O$ , the time of reaction is about 12 hrs. The conversion does not take place if the cellulose is completely dried. Only cellulose which has been modified or hydrated in certain ways yields this product. The soly. of the product from cellulose regenerated from cellulose acetate is only 0.1 that of the product from viscose. Mercerized cellulose yields varying amts. of the alkali-sol. product. Sulfite pulp, heated in xylene for 6 hrs. at  $140^\circ$ , gave a product, 94% of which was soluble, though entirely dry cellulose did not give the desired results; it appears that moisture is necessary in the hydrolysis. Alkali-sol. cellulose has a Cu no. of 12.5-14%, which is not changed by boiling with  $Ca(OH)_2$ . The alk. soln. cannot be pptd. by concd. alkali, but is pptd. by acids, different salts and their solns. The product is not changed by  $Ac_2O$  but does react with  $Me_2SO_4$ . It forms a *tribenzoate*, completely sol. in  $CHCl_3$ . With  $PhHNNH_2$  it forms a dark-yellow amorphous compd.,  $C_{13}H_{15}O_{14}.N_2HPh.4H_2O(?)$ , m.  $200-10^\circ$ . C. J. WEST

The manufacture of straw pulp by means of chlorine. RAYMOND FOURNIER. *Papier* 25, 173-7(1922).—General discussion of this process with a comparison of the Cataldi and de Vains processes. (Cf. Pomilio, C. A. 15, 4050; De Perdiguer, C. A. 16, 1864). A. P.-C.

Blotting paper and its manufacture. ANON. *Papeterie* 44, 98-101, 146-54,

393-400(1922).—The qualities required of blotting paper are discussed, and numerous practical hints are given as to the best conditions of working. A. P.-C.

**Bleaching of ground wood.** ANON. *Industria della Carta; Papeterie* 44, 490-4 (1922).—Brief description of the method of bleaching groundwood with  $\text{SO}_2$  and of the app. used, with a mention of the chief precautions required. A. P.-C.

**Effects of chemical treatment and of beating on paper pulps.** E. ARNOULD. *Papier* 25, 193-6(1922).—A brief and general discussion. A. P.-C.

**Standardization of China clay.** JAS. STRACHAN. *Chem. Trade J.* 70, 669-1 (1922).—The  $\text{H}_2\text{O}$  content of paper clays should be standardized. Probably 12% is av. for clays as sold. This could be reduced to 1 or 2% without danger of calcining. Suggested standards for grit are: not over 0.1% in clays for coating; not over 0.25% in clays for fine papers; not over 0.5% in clays for news. C. H. KERR

**Cellulose ether composition for films.** W. R. WEBB. U. S. 1,418,413, June 6. A flowable compn. for making films is prepd. with cellulose ether dissolved in  $\text{CCl}_4$  and alc.

**Viscose solutions.** W. P. DREAPER. U. S. 1,418,135, May 30. A xanthate soln. is prepd. by treating a cellulose mass from which air has been removed with caustic alkali at a temp. of below  $5^\circ$  (preferably about  $0^\circ$ ) and then with  $\text{CS}_2$ . The treatment at low temp. serves to produce a uniform product of low viscosity.

**Non-inflammable celluloid.** A. EICHENGRÜN. U. S. 1,420,028, June 20. A so-called non-inflammable "celluloid" is prepd. from acetylcellulose together with a "camphor substitute" such as acetylmethylaniline and a volatile solvent such as alc. or acetone which are kneaded together to produce a product which is solid when finished.

**Paper pulp from straw.** C. and J. BACHE-WÜG. U. S. 1,418,353, June 6. Straw after softening with  $\text{NaCl}$  soln. is subjected to a kollergang treatment and is then digested with bisulfite soln. and subjected to a second kollergang treatment, to sep. the fibers.

**"Safety paper."** V. E. GOODMAN. U. S. 1,417,820, May 30. A black or dark-surfaced paper is coated with an opaque but light-colored compn. such as a compn. contg. Mn ferrocyanide which is sensitive to chem. eradicators.

**Translucent paper.** F. W. HOCHSTETTER. U. S. 1,419,379, June 13. A compn. for rendering paper translucent is formed of linseed oil or a similar drying oil 10, bleached shellac 3 and absolute alc. 20 parts.

**Composition for rendering paper transparent.** S. H. PARRISH. U. S. 1,419,750, June 13. A mixt. of fir balsam, rosin, turpentine and  $\text{CCl}_4$ .

**Grease-proofing paper.** W. L. WRIGHT. U. S. 1,417,708, May 30. The paper is treated with an aq. soln. of gelatin, glycerol and alum which is satd. with sugar.

**Water-proof paper or cloth.** GENJI FUJITA. *Jap.* 39,291, July 18, 1921. Addition to 27,411. A mixt. of blood plasma 150, Japanese lac 50, bird-lime 200, pine resin 100, glass beads 30, kaolin 50, perilla oil 350, massicot 30, and Fe powder 40 parts is painted on paper or cloth.

**Filled paper pulp.** E. G. ACHESON. U. S. 1,419,951, June 20. A filler such as white clay is deflocculated preparatory to mixing it with paper pulp, in order to form a mixt. with which rosin size and alum may be combined.

**Recovering fiber from waste printed paper.** KINTARÔ AMANO, SENTARÔ KUMAGAI and TATSUJIRÔ CHIBA. *Jap.* 39,352, July 21, 1921. Waste paper 75 kg. is boiled with a mixt. of 108 l. waste liquor obtained in the manuf. of bean-curd, 108 l.  $\text{H}_2\text{O}$ , and 2.25 kg. soap for 0.5 hr., then beaten during 2-3 hrs., bleached, washed, and dried as usual.

**Recovering fiber from paper board or similar sheet material.** M. F. WILLIAMS. U. S. 1,417,961, May 30. Paper board or similar material is shredded into slivers which are then subdivided and classified by air currents.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

**Explosions and their causes.** ALEXANDER McEACHERN. *Can. Mining J.* **43**, 395-7(1922).—A review of information gathered regarding explosions in coal mines, including descriptions of personal experiences with such explosions, and suggestions as to precautionary measures to be taken in mining looking to the prevention of explosions.

CHARLES E. MUNROE

**Explosive limits.** W. P. JORISSEN. *Chem. Weekblad* **19**, 193-4(1922).—Small quantities of various substances added to an explosible mixt. may influence the explosive limits (cf. *Chem. Weekblad* **18**, 636). A connection between the chem. nature of a gas and the explosive limits will be found by further expts.

R. BRUTNER

**Ignition of coal dust by electric arcs.** L. C. ILSLEY AND E. J. GLEIM. *Bur. of Mines, Repts. of Investigations* No. 2365, 7 pp.(1922).—The results confirm those of Thornton and Bowden (cf. *C. A.* **4**, 1908) in proving that coal dust and air can be exploded by elec. arcs and further that this can be accomplished under conditions that might prevail in a mine or about a pulverized coal plant.

CHARLES E. MUNROE

Fires in textile mills (COLLINS) **25**.

**Explosive.** T. L. DAVIS. U. S. 1,419,027, June 6. Pentanitronaphthol is prepd. by action of  $\text{HNO}_3$  and  $\text{HgNO}_3$  on  $\text{C}_{10}\text{H}_8$ , followed by addition of  $\text{H}_2\text{SO}_4$ .

**Pyrotechnic composition.** H. J. NICHOLS. U. S. 1,419,295, June 13. A compn. for use in pyrotechnic signalling devices is formed from red P,  $\text{MnO}_2$ ,  $\text{ZnO}$ , Mg, Al and linseed oil.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

**The importance of theoretical considerations for the dye industry. The nature of the diazonium group.** H. A. J. SCHOUTISSEN. *Chem. Weekblad* **19**, 217-20(1922).—The diazonium group is a substituent of negative character, even more negative than the  $\text{NO}_2$  group. Exptl. evidence for this fact is furnished by studying the action of  $\text{H}_2\text{SO}_4$ - $\text{HNO}_3$  mixts. on diazonium compds. at low temp. (0-20°); no nitro compd. will be formed under conditions which are sufficient to nitrate non-substituted benzene. The diazonium group therefore prevents nitration, which is known to be a sp. action of all negative substituents in the aromatic nucleus, like, e. g., Cl, Br,  $\text{NO}_2$ , etc. Another evidence for the negative character is the following. The transformation of a diazonium group into an azo group and the coupling with a substituted phenol does not take place readily in a very acid soln. unless there is a negative substituent in the ring. This is applied to bis-diazonium compds, which the author succeeded in making by "tetra-azotizing" *p*-phenylenediamine (or substitutes). If a bis-diazonium compd. is treated with a phenol in acid soln. coupling takes place on one side only. One of the diazonium groups is transformed into an azo group and coupled owing to the negative character of the other diazonium group; this last one, however, remains unchanged in acid soln., but if the resulting diazonium azo compd. is transferred into a weak alk. soln. also

the second group is transformed into an azo group, and it may be coupled with another phenol. In this way a new method of prepg. disazo compds. is obtained. This is of practical importance for the dye industry as there are numerous valuable dyes among the disazo compds.

R. BRÜTNER

Interesting sources of natural dyestuffs. C. D. MELL. *Textile Colorist* 44, 321-5(1922); cf. C. A. 16, 1321.—General information in regard to: the tutu or toto plant (*Coriaria ruscifolia*), the wine berry tree (*C. sarmentosa*), and the ink plant (*C. thymifolia*) which give black dyes; the leather bush (*C. myrtifolia*), and purple sumac (*C. atropurpurea*) (these all contain gallotannin and are related to sumac); the osage orange (*Toxylon pomiferum*), also called bois d'arc, bodock, bodark, mock orange, bow wood, osage apple, yellow wood and hedge, which yields a yellow dye resembling fustic; gamboge, which is the gum-resin of the *Garcinia hanburii*; henna or *Lawsonia inermis*; and the loblolly bay tree (*Gordonia lasianthus*), also called the black laurel, tan or bay tree and used for both red dyeing and tanning. *Ibid* 383.—The cones and bark of the pine tree contain tannin and a red dyestuff known as phlobaphen or oak-red. The chica, caracuru, karwirae or vermillion Americanum (*Arrabidaea chica*), yields a red or purple dyestuff formed by fermentation of the bruised leaves. It dyes cotton orange-yellow.

CHAS. E. MULLIN

The determination of insoluble matter in basic dyestuffs. CLARENCE P. HARRIS. *Color Trade J.* 9, 158-9(1921).—Pour 250 cc. acid-free H<sub>2</sub>O heated to 80° upon 1 g. dyestuff in a 1 l. beaker. Stir 5 min. and decant through a specially prepd. filter. Add 100-cc. portions of H<sub>2</sub>O at 80° to the residue and stir each 10 min. Repeat until all solids are on the filter. Wash the filter at 70-80° until free of color, dry at 60° or less, remove the residue from the paper and weigh.

CHAS. E. MULLIN

The determination of light fastness of dyestuffs. H. S. BUSBY. *Textile Colorist* 44, 367-9(1922).—Recommends the detn. of "abs. fastness" by means of the dye soln. rather than the "fiber fastness" on the dyed fabric.

CHAS. E. MULLIN

The fastness of colors. J. M. MATTHEWS. *Color Trade J.* 9, 213-20(1921).—A discussion of the quality of colors, especially in regard to fastness. An abstract from an address delivered by J. J. Hummel in 1891 is given to prove that the lack of fastness is not a new complaint due to domestic dyes, but has always been present.

CHAS. E. MULLIN

The padder in dyeing cotton. JOSEPH M. KARPPLER. *Textile World* 61, 3789-93; *Am. Dyestuff Rep.* 10, 456-8(1922).—The causes and prevention of faults in padder dyeing.

CHAS. E. MULLIN

Notes on fur dyeing. W. F. A. ERMEN. *J. Soc. Dyers & Colour.* 37, 168-9(1921).—Directions for dyeing furs with *p*-phenylenediamine, dimethyl-*p*-phenylenediamine, *p*-aminophenol and cresol, *o*-aminophenol, amidol, diaminoanisole, diaminoanisole and phenylenediamine, and diphenylamine derivs.

CHAS. E. MULLIN

Formic acid and dyeing. GRO. H. JOHNSON. *Am. Dyestuff Reporter* 11, 1-4(1922).—A review.

E. H.

Time and temperature control in piece dyeing. NORPOT INCOLL. *Am. Dyestuff Reporter* 11, 13-5(1922).

E. H.

Tin weighting in silk. A. A. COOK. *Textile World* 61, 2219-21, 3185-7(1922).—This investigation was made to det.: to what extent the ash represents the actual weighting in the silk and if there is a const. factor which may be applied; if there is a definite relation between the sp. gr. and amt. of weighting; and what factors are essential in the detn. of weighting by the stripping method. Specially prepd. skeins weighted with 10 to 100% tin phosphate and silicate were used in all expts. Expts. with the ashing method showed variations of -10.9 to -35.8%; that the factor would vary from 1.12 to 1.56; and that there is no generalization which applies to these variations. The sp.

gr. of samples contg. 20.2 to 77.7% weighting varied from 1.47 to 1.79 and were fairly consistent but not enough so for strict analytical work. An investigation of the stripping method recommended by Matthews in "The Textile Fibers," in which the weighted silk is immersed alternately in boiling 3% HF and 2%  $\text{Na}_2\text{CO}_3$  shows that the silk itself is attacked. Further investigation of the stripping method shows that HF is superior to HCl; that 60–70° is the best temp.; and that the time factor is not so important. The following method is recommended: Dry at 105° for 2 hrs. and weigh. Boil the 1 or 2 g. sample in 250 cc. distilled  $\text{H}_2\text{O}$  for 30 min., dry at 105° to constant wt.; loss is  $\text{H}_2\text{O}$ -sol. finishing materials. Work the sample in 2% HF soln. at 60–70° for 20 min., rinse, and work in 2%  $\text{Na}_2\text{CO}_3$  soln. at 60–65° for 20 min. Rinse well and dry to constant wt. at 105°. This loss represents tin weighting. Det. the residual ash in the silk by burning as a check on the above. This ash figure may be added to the weighting found above as a correction.

CHAS. E. MULLIN

**Topping.** GRO. EDMONS. *Textile Colorist* 44, 376–8(1922).—In topping substantive with basic dyes, it is recommended to add the tannic acid to the substantive dye bath, squeeze, pass into the Sb bath, then rinse and top.

CHAS. E. MULLIN

**Principle of cottonizing.** GOTTFRIED KRANZLIN. *Faserforschung* 1, 121–38 (1921).—General discussion of the methods of sepg. and purifying the fibers of hemp and flax, with references to patent literature.

C. J. WEST

**Kier boiling cotton goods.** F. J. WALL. *Textile Colorist* 44, 372–3(1922).—General.

CHAS. E. MULLIN

**The bleaching and boiling-out of cotton.** I. J. M. MATTHEWS. *Color Trade J.* 8, 10–3(1921).—The principles of bleaching, the analysis of cotton and the nature of its impurities. II. *Ibid* 38–42.—The action of alkalis and lime on cellulose and the use of soaps and solvents in kier boiling. III. *Ibid* 76–80.—The use of  $\text{NaHSO}_3$  in kier boiling and the removal of sizing. Early history. IV. *Ibid* 118–23.—Details of the lime boil and the use of  $\text{SrO}$ . The  $\text{Na}_2\text{CO}_3$  boil and the compn. of spent liquors. The gray sour. V. *Ibid* 202–6.—Loss and change in count of yarns in boiling-out. Use of  $\text{Na}_2\text{S}$  in kier boiling colored goods. The use of soaps, mineral oils and various compns. in kier boiling. Malt ext. steeping. VI. *Ibid* 9, 4–8(1921).—Details, faults and loss of strength in kier boiling. VII. *Ibid* 58–61.—Bleaching with hypochlorites, the control and efficiency of the operation. The action of  $\text{CO}_2$ . VIII. *Ibid* 109–12.—Prepn. of  $\text{Ca}(\text{ClO})_2$  liquors. IX. *Ibid* 172–6.—The use of oxalic acid. The action of  $\text{CO}_2$  on bleaching powder. Stability of hypochlorite solns. Effect of neutrality. Cf. C. A. 14, 2422.

CHAS. E. MULLIN

**The acid content of retted flax in the nascent, artificially and naturally dried states.** G. HABERMANN. *Faserforschung* 1, 190–9(1921).—Tables are given showing the relation between the acids ( $\text{HCO}_2\text{H}$ ,  $\text{AcOH}$ ,  $\text{PrCO}_2\text{H}$ ) formed in canal retting and those ( $\text{AcOH}$ ,  $\text{PrCO}_2\text{H}$ ,  $\text{C}_6\text{H}_5\text{O}_2$ ) in warm water basin retting. The total acid per 100 cc. retting liquor in the 1st case was 0.09921 g., in the 2nd 0.14502 g. The retting process should be so conducted that the smallest amt. of volatile acid is formed, and the acid present should be decreased as much as possible before drying the fiber.

C. J. WEST

**Degree and importance of the acid formation in biological retting.** G. RUSCHMANN. *Faserforschung* 1, 33–46(1921).—The amt. of acidity produced in the warm bath retting process is found to be 2.5 times that for canal retting. Figures are given showing that in the case of the warm bath process, the strength of the fibers is much greater (34.82 as compared with 22.61) when they are artificially dried (time of treatment, 74 hrs., which apparently corresponds to max. acid production).

C. J. WEST

**Lime in the textile industry.** E. R. DARLING. *Textile World* 61, 3793–5(1922); *Am. Dyestuff Rep.* 11, 16–8(1922).—For the lime boil, D. considers 94%  $\text{CaO}$ , with less

than 2.5% Mg, 3% Si and 2% Fe and Al oxides sufficiently pure. For dyeing less than 1% Fe oxide should be present.

CHAS. E. MULLIN

**Causes of fires in textile mills.** J. A. COLLINS, JR. *Textile World* 60, 3257-61 (1921).—Extinguishing textile mill fires. *Ibid* 61, 68-75, 1407-11(1922).—Preventing the spread of fires. *Ibid* 61, 1947-9, 1991(1922).—Prevention of textile mill fires. *Ibid* 3523-31(1922).

CHAS. E. MULLIN

Fertilizer experiments with the nettle (BREDEMANN) 15. Waterproofing paper or cloth (Jap. pat. 39,291) 23.

SPENNRATH-GÜRTLER: **Materiallehre für die Textilindustrie, enthaltend die Rohstoffe sowie die Herstellung und Untersuchung der Gespinste.** 3rd Ed. Berlin 1920: M Krayn. 115 pp. M 13. Reviewed in *Fortschritte Chem.* 17, 111(1922).

**Acridine dyes.** C. VAUCHER and H. SPETTEL. U. S. 1,418,852, June 6. Poly-halogenated dyes suitable for use on leather are obtained by direct halogenation of basic acridine dyes or their leuco compds. Acridine orange sulfate treated with NaBr and H<sub>2</sub>SO<sub>4</sub> yields a dibromo deriv. giving a red color on tannin-mordanted cotton and on leather. The same dye may be prepd. by treating acridine orange sulfate with Br and NaClO<sub>2</sub> in PhNO<sub>2</sub>. Leucotetramethyldiaminoacridine sulfate when treated with Cl and H<sub>2</sub>SO<sub>4</sub> produces a somewhat similar product.

**o-Hydroxyazo dyes.** R. HAUGWITZ. U. S. 1,419,500, June 13. The diazonium compd. of 2-amino-1-hydroxybenzene-4-sulfonic acid is united in alk. soln. with 8-hydroxyquinoline and the dye formed is salted out. It dyes wool brown tints, which on treatment with K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> turn to bordeaux fast to light and milling. The dye gives a red soln. with H<sub>2</sub>O, is insol. in common org. solvents and is destroyed by reducing agents. Other dyes the tints of which are brown and the Cr lakes of which are bordeaux may be obtained by combining 4-nitro-2-diazo-1-hydroxybenzene-6-sulfonic acid or 4-chloro-2-diazo-1-hydroxybenzene-5-sulfonic acid with 8-hydroxyquinoline. 4,6-Dinitro-2-amino-1-hydroxybenzene when diazotized and coupled in alk. soln. with 8-hydroxyquinoline-5-sulfonic acid produces a dye giving corinth tints on wool becoming more reddish and fast to light on treatment with dichromate. 4-Nitro-2-diazo-1-hydroxybenzene-6-sulfonic acid and 8-hydroxyquinoline-5-sulfonic acid yield a dye which produces brownish violet tints on wool becoming bordeaux on treatment with Cr compds.

**o-Hydroxyazo dyes.** W. HERZBERG and L. SCHARFENBERG. U. S. 1,419,501, June 13. 2-Amino-4,6-dichlorophenol when diazotized and combined with 8-chloro-1-hydroxynaphthalene-5-sulfonic acid in alk. soln. produces a dye giving fast blue tints on wool with Cr mordants. The diazo compd. of 3,4,6-trichloro-2-aminophenol, similarly combined, also yields a blue dye of like properties.

**Dyes.** W. HERZBERG and G. HOPPE. U. S. 1,419,502, June 13. Yellow to brown cryst. dyes are obtained by condensing hydroxyazine (e. g., eurhodols) with a quinonoid compd. substituted by a halogen in the quinonoid nucleus, e. g., 2-chloro-1,4-naphthoquinone, 2,3-dichloronaphthoquinone, tetrachlorobenzoquinone or 2,3-dichloro-4-naphtholsultamquinone. When reduced with hyposulfite in alk. soln. these dyes give a reddish or orange vat from which vegetable and animal fibers are dyed yellow to orange tints fast to Cl and soap.

**Dyeing animal fibers.** H. TOEPFER. U. S. 1,417,869, May 30. Co salts such as sulfate, chloride or acetate are used with azo dyes derived from nitro-o-amino-phenols, in order to improve brilliancy and fastness.

**Apparatus for dyeing skeins.** E. S. HALTER. U. S. 1,417,825, May 30.

**Viscose silk.** E. BRONNERT. U. S. 1,419,714, June 13. Artificial silk fibers of

a size of from 6 to 1 deniers are formed by forcing raw viscose through openings of suitable size into a pptg. bath of  $H_2SO_4$  and  $(NH_4)_2SO_4$  in which the concn. of the acid is inversely proportional to the sq. root of the fineness of the thread desired measured in deniers and the amt. of acid per unit vol. of the bath (calcd. the sulfate as equiv. to half its wt. of  $H_2SO_4$ ) is maintained up to a quantity standardized for each size of thread. Cf. C. A. 16, 501, 1016.

**Increasing the durability of carbonized wool and artificial wool.** M. BECKE. Ger. 334,528, Feb. 17, 1920. The deleterious action of carbonizing agents upon wool may be prevented by the addn. of HCHO, acetaldehyde, benzaldehyde, acetone, Et acetooacetate or other condensing agents.

**Preparing vegetable fibrous materials.** D. E. DELAPE. U. S. 1,417,889, May 30. Fibrous material such as hemp, straw or yucca is passed between rollers, scraped, brushed and combed and is then treated with an aq. soln. contg. not more than 1% of an active or saponifying reagent such as NaOH and not more than 2% of a resinous and oily substance such as palm oil and resin and after this treatment the product is again brushed and bleached.

**Waterproofing of animal fibers.** KANJIRŌ KIMURA. Jap. 39,435, Aug. 3, 1921. Addition to 35,827. Animal fibers, or products or fabrics made of animal and other fibers are dipped into metallic salt soln., such as 4–8° Bé. soln. of  $Al(AcO)_3$ , a mixt. of  $Al(AcO)_3$  and  $Fe(AcO)_3$ , Sb, Sn, or Pb salts soln., dried and painted with a mixt. of lanolin 100, alkali hydroxide 15, alc. 200, and  $H_2O$  685, washed and dried or further treated with 3% HCHO gas for 1 hr. The method does not destroy the natural state of fibers and the waterproofing is not destroyed by washing with alkali or soap or by heat.

**Protecting animal fibers of mixed goods from injurious effects of alkaline solutions.** P. GOLDBERG, P. ONNERTZ and A. PETERS. U. S. 1,419,497, June 13. Sulfite cellulose waste liquor is added to alk. solns. such as dyeing, mercerizing or degumming solns. in order to protect animal fibers.

**Finishing textile fabrics.** F. W. TULLY. U. S. 1,417,587, May 30. Woven fabrics are rendered more resistant to wear by treatment with a small amt. of a soln. of shellac and castor oil in a volatile solvent such as alc., which is evapd., so as to avoid matting or adhesion of the fibers.

**Carrotting hairs.** C. PICHARD. U. S. 1,419,754, June 13. Hairs are prepd. for felting by treating them with a liquid which will expand on freezing, e. g., dil. aq.  $CH_3O$  soln., and then freezing the liquid after it has penetrated the cells and medullary ducts of the hair.

**Apparatus for degumming, "fiberizing" and felting straw.** J. K. TOLES. U. S. 1,420,162, June 20.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**Characters and uses of cuica resin.** ANON. Bull. Imp. Inst. 19, 144–5 (1921).—"Cuica" or "quika" resin is derived from *Cercidium spinosum*. The material was pale yellow and contained 2.1% moisture, 2.1% ash, 15.3% matter insol. in boiling EtOH and 82.6% matter sol. in boiling EtOH. The resin was inferior to other resins for the prepn. of oil varnishes because of the low soly. in turpentine and the film left on evapn. of the solvent did not harden for several days. Thin lacquers made from cuica resin were also of inferior quality.

R. L. SIBLEY

**Paints for integrating spheres.** A. H. TAYLOR. Trans. Illum. Eng. Soc. 16,



587-9, 599-605(1922).—Requirements for a satisfactory paint for photometric integrating spheres are very severe. The desired paint should be perfectly mat, reflecting light in accordance with the cosine law; it should be tenacious and somewhat elastic, it should be pure white with non-elective reflection and should suffer no change in color with age or temp., and its reflection factor should be high. No paint fulfilled all of these requirements but a ZnO paint consisting of cellulose lacquer and ZnO, 4 parts each by wt., and 1 part EtOH was the most satisfactory. ZnO is added slowly to the lacquer and EtOH, with const. stirring until a smooth thick paste is obtained. Afterwards 2 parts of EtOH and 1-2 of waterwhite turpentine were added. The paint was used thinner than ordinary oil paints. It was tenacious, permanent in color, possessed a very high reflection factor and a good covering power. W. H. BOYNTON

Drying oils from petroleum and other products, produced by chlorination and dechlorination. HENRY A. GARDNER AND E. BIELOUSS. *J. Ind. Eng. Chem.* **14**, 619-21 (1922).—It is possible to introduce and evenly distribute Cl into the hydrocarbon mol. of so-called "neutral oils" and to dechlorinate the product by heating to 250°, thereby producing an unsatd. oil with a drying value equal to raw linseed oil. It polymerizes to a solid, elastic mass when heated to high temps., and vulcanizes with  $S_2Cl_2$ . Its dark color limits its use to black paints, and for this purpose its durability is not entirely the equal of that of linseed oil. F. A. WERTZ

Nauli gum, a new oleoresin from the Solomon Islands. ANON. *Bull. Imp. Inst.* **19**, 457-9(1921).—The sample consisted of lumps of a fairly soft oleoresin with a strong odor of aniseed. It was pale yellow with occasional black streaks and somewhat sticky. Analysis showed: moisture 2.5%, volatile oil 10.4%, resin 81.8%, matter sol. in  $H_2O$  3.7%, matter insol. in EtOH (mineral and vegetable impurities) 1.6%. The volatile oil was a pale yellow, limpid liquid, having an odor of aniseed and possessing the constants  $d_{40}^{20}$  0.9592,  $\alpha_D^{20}$  25.91,  $n_D^{20}$  1.5438, acid value 0.65, ester value before acetylation 1.6, ester value after acetylation 24.6. Purified resin was reddish brown, transparent, hard and very brittle, m. p. 69-71°, acid value 9.0, ester value 16.4. R. L. S.

Apparatus for investigating resins, pitches, etc. (ANON.) 1.

Paint. H. C. KISHPAUGH. U. S. 1,417,842, May 30. A paint for plaster, brick or stone is prepd. from  $CaCO_3$  100,  $CaO$  5 25 parts and other pigments and vehicle such as  $H_2O$ . Cf. *C. A.* **16**, 1671.

Paint. V. WILLIAMSON. U. S. 1,418,416, June 6. Ordinary paint is mixed with cement and linseed oil in order to render it more resistant to the weather.

Removing paint or varnish from surfaces. W. TIDDY. U. S. 1,417,955, May 30. Heavy bases from coal tar, substantially free from pyridine, are used as paint or varnish removers.

Oil pastes of lead sulfate made from water pastes. D. WHYTE. U. S. 1,419,655, June 13. Water is expressed and the aq. paste is churned with oil in just sufficient amt. to break out  $H_2O$  of crystn. and form a stiff paste.

Reversing impressions in printing. T. S. FOX. U. S. 1,420,086, June 20. Impressions made on a metal plate with a  $H_2O$ -sol. ink are dusted with gum arabic or a similar pulverulent material and are then treated by rolling on another ink soln. in a different solvent, e. g., an acid-resisting ink, and dissolving away the  $H_2O$ -sol. ink to leave the first-coated portions of the plate exposed for etching.

Printing plate. TOKUSABURŌ MATSUSHIMA. Jap. 39,452, Aug. 3, 1921. A metallic plate, painted with a mixt. of 1 oz. fish glue, 4 g.  $(NH_4)_2Cr_2O_7$ , 4 oz. egg white, and 20 oz.  $H_2O$  and dried, is fixed with a negative by exposing through a screen and plated by the usual method. It is simple in operation.

**Pigment-stirring pan.** C. P. BOSSERT. U. S. 1,417,885, May 30.

**Soluble phenol condensation products.** KENZŌ HATTA, KENRICHŌ NAKAJIMA and NIPPON KWAKŌ KABUSHIKI KAISHA. Jap. 30,310, July 18, 1921. Phenols, such as cresol, PhOH, etc., are condensed by treating with formaldehyde or like methylene compd. in the presence of Japanese lac. The product is sol. in essential or fatty oils and is used in *paints*. E. g., an intimate mixt. of 100 parts of phenol or cresol, 200 of 35% formalin, 50 Japanese lac is heated for 2 hrs. at 120° under 1.4 atm. pressure, or for 48 hrs. at 120° under ordinary pressure. The product is distd. and sepd. from H<sub>2</sub>O and excess of formaldehyde.

**Preservative coating for use on metals, wood, masonry, pasteboard, leather or other materials.** E. RECK. U. S. 1,418,172, May 30. Minium is mixed with half its amt. of coal tar and with a vehicle such as turpentine.

## 27—FATS, FATTY OILS AND SOAPS

E. SCHERUBEL

**Japan tallow.** ANON. *Bull. econ. Madagascar* 18, 215(1921); *Bull. Imp. Inst.* 19, 520(1921).—Japan tallow is derived from the fruits of "*Rhus succedanea*." The kernels yield 31–34% fat and the mesocarp 28.9%.

R. L. SIBLEY

**Technical Ukuhuba fat acids.** K. FRICKER. *Z. deut. Oel-Fett-Ind.* 42, 297(1922).—The acids of Ukuhuba fat yield an excellent soap, but it is difficult to obtain light-colored acids on account of the presence of large amt. of resins in the original fat. An examn. of the distd. acids from a trial charge (autoclave with H<sub>2</sub>SO<sub>4</sub>) showed a m. p. (Shukov) of 37.7°, acid no. 240.1, sapon no. 238–237, acetyl no. 27.76, I no. 11.4. The ethyl esters of the satd. acids had a m. p. of 8–18° and a sapon. no. of 225.0, while the acids liberated from these esters had a m. p. of 41.5–42.5° and a sapon. no. of 215.6, indicating the presence of several satd. acids below myristic acid and above, including stearic acid.

P. ESCHER

**The fatty acids of colza oil.** E. RAYMOND. *Bull. soc. chim.* 31, 414–9(1922).—The fatty acids prepd. from the oil in the regular manner were subjected to distn. and 5 fractions obtained as follows: (1) solid, (2) b. 220–225°, (3) b. 225–227°, (4) b. 227–240°, and (5) b. over 240°. The solid fraction was palmitic acid. The 3rd fraction contained a small amt. of stearic acid, a small amt. of linoleic, and linolenic acids whose bromides were insol. in ether and petroleum ether, and a large amt. of linolenic and linoleic acids whose tetrabromides were sol. Fraction 2 was a mixt. of 1 and 3. Fraction 4 consisted of erucic and stearic and a little oleic acid. Fraction 5 consists of erucic acid.

E. SCHERUBEL

**Catalytic decomposition of shark oil.** ALPHONSE MAILHE. *Bull. soc. chim.* 31, 249–52(1922).—Shark oil behaves similarly to linseed and colza oils. Its vapors when heated at 600–650° in the presence of a catalytic mixt. of Al and Cu form gaseous and liquid products. The former consist of hydrocarbons and H. The latter after treating with dil. caustic and hydrogenating at 180° to 200° with Ni yield a colorless product of agreeable odor. By fractionation between 70° and 150° a product is obtained having densities varying from 0.7305 to 0.7773 and between 150° and 200° the densities vary from 0.7833 to 0.8120. The fraction 100° to 105° contained benzene and toluene and that between 135° and 140° *m*-xylene. Fractional distn. of the hydrogenated acids gave portions boiling from 175° to 270°. The portion between 210° and 225° when heated with MeOH and H<sub>2</sub>SO<sub>4</sub> gave the Me ether of enanthylic acid. The fraction 240° to 245° gave pelargonic acid by the same treatment. The last 2 fractions upon cooling gave crystals which had the m. p. of lauric acid.

E. S.

**The oleic acid content of the free fatty acids in coconut-oil foots.** F. WITTKA. *Z. deut. Oel-Fett-Ind.* **42**, 377-8(1922).—On account of the high I no. frequently found in coconut-oil foots a comparison was made with the original oil; the first figure represents the acid no. and the second the I no.: raw oil 8.03, 8.65; refined neutral oil 0.16, 8.41; fatty acids from the neutral oil 266.1, 9.02; fatty acids in foots 258.8 (contains neutral fat), 12.71. A confirmatory refining test, made in the lab., gave like results: oil refined with  $K_2CO_3$  0.16, 8.41; foots 201.0, 18.44. These high I nos. in coconut-oil foots are explained as follows: The rind oil of the copra contains a higher % of olein than the clear meat oil:

	Wt. of portion.	Oil content.	Acid no.	I no.
Inner portion	95%	70.96%	0.46	6.43
Outside brown skin	8%	46.97%	7.5	38.76

Apparently the oil of the outside skin with its high olein content is more easily decompd. by the lipases of the oil than the inner portion, contg. little olein so that the liberated free acids show a higher I no. than the neutral oil. A good coconut oil therefore will give a high I no. in its foots, the higher the more effectual the free fatty acids have been removed with sapon. any of the neutral oil. P. ESCHER

**Anhydrides of the higher fatty acids.** IDA TACKER. *Chem. Umschau.* **29**, 175-9 (1922); cf. *C. A.* **15**, 863.—The literature of the prepn. of the anhydrides of the fatty acids is reviewed, and the prepn. of oleic anhydride is described. Oleic acid and acetic anhydride are heated for 6 hrs. to 140-160° in a closed tube, the excess of anhydride together with the acetic acid formed is distd. off under vacuum and any unchanged oleic acid is neutralized by a cold alc. 50% soln. of  $Na_2CO_3$ ; the operation is carried on in an atm. of  $N_2$ . Oleic anhydride forms silvery white scales m. 22.2°. Resorption expts. with animals showed an efficiency of 95% compared with the resorption of its glyceride. Erucic anhydride m. 46-46.5°, resists the action of 25% HCl and 0.1 N alkali but is completely reconverted into erucic acid by boiling  $H_2O$  and by steam. Other anhydrides of the higher fatty acids form ethyl esters when titrated with 0.1 N alkali in abs. alc. according to the reaction:  $(R.CO)_2O + C_2H_5OH + KOH = R.COOK + R.COOC_2H_5 + H_2O$ . The anhydrides of linseed oil form a sticky film even when dried 3 weeks, while the original glycerides dry normally, showing that the no. of double C bonds is not the only factor in the drying process. The wt. increase after 10 days was 14.46% for the anhydrides against 2.87% for the neutral linseed oil; this ratio of 5 : 1 became 4 : 3 after drying for 6 wks. P. ESCHER

**Candle nuts.** WEST AND MONTES. *Philippine J. Sci.* **18**, 619(1921); *Bull. Imp. Inst.* **19**, 520(1921).—Candle nut oil (*Aleurites moluccana*) is composed of the glycerides of the following acids: linolenic 6.5%, linolic 33.4%, oleic 56.9% and solid acids 2.8%. In chem. compn. the oil resembles linseed oil rather than tung oil.

R. L. SIBLEY

**The phenolphthalein reaction of soaps.** TH. LEGRANDI. *Z. deut. Oel-Fett-Ind.* **42**, 314(1922).—A hot alc. soln. of a K soap gave a red color with phenolphthalein, disappearing on cooling and reappearing on second heating. When excluding atm.  $CO_2$  during cooling, the reheated soln. retained its red color. An alc. soln. of  $K_2CO_3$  behaved in the same way, but parallel tests with  $Na_2CO_3$  showed absence of color in all cases. It seems that hydrolysis occurs in hot alc. solns. of  $K_2CO_3$  and K soaps but does not occur in the corresponding Na compds. Washed  $CO_2$  gas was next passed at room temp. into an alc. soln. contg. about 15% liquid fatty acids: A turbidity occurred which upon heating to 70-80° disappeared. Evidently the soap decomposed by  $CO_2$  at ordinary temp. liberating fatty acids; it is possible that the presence of these acids is responsible

for the greater lathering power of K soaps, since Na soaps increase their lathering power by the addn. of free fatty acids.

P. ESCHER

**The use of hexalin and methylhexalin for soap making.** BERGO. *Seifensieder Ztg.* 49, 416-7(1922); cf. C. A. 16, 2614.—Further expts. are recorded in which 7.5% methylhexalin were mixed with a charge of 50 tallow and 50 palm kernel oil acids and the mixt. was run into 50 pts. of 39° NaOH. Sapon. occurred rapidly and then 5, 10, 15 and 20% of hydrocarbon oil (decalin) were added to small trial portions of the charge and for comparison the same tests were made using benzine,  $\text{CCl}_4$ , trichloroethylene, and tetralin. Those soaps which contained 5 and 10% hydrocarbon oil were normal in consistency; those with 15 and 20% were slightly softer, and normal after air drying. All showed a good lather and possessed extraordinary cleansing power. The odor of the decalin soaps was far better than that of the others. B. suggests that the textile industry is the proper field for such soaps, especially for the liquid K soaps. Two such liquid K soaps were made, one with 100 pts. methylhexalin and 100 pts. soy bean acids, the other with 100 methylhexalin and 100 palm kernel oil acids. After a rapid sapon. 50-100% of methylhexalin, benzine, tetralin, etc., were added as before to small test portions. Some of these diluents thickened the soap in the smaller addns. but thinned it again in the larger %. The finished soaps were clear liquids up to 200% addns., but turbid above 200%. When dild. with 10 vols.  $\text{H}_2\text{O}$ , the soaps below 200% gave clear solns., those above 200% produced permanent emulsions. The cleansing power of these methylhexalin soaps stands unsurpassed.

P. ESCHER

**The density of sulfuric acid for glycerol determinations by the dichromate method.** J. KELLNER. *Z. deut. Oel-Fett-Ind.* 42, 345(1922).—The  $\text{H}_2\text{SO}_4$  sp. gr. of 1.230 is the lowest sp. gr. at which glycerol is completely oxidized by dichromate (cf. C. A. 16, 845). But glycerol contg. NaCl liberates Cl increasingly with increasing acid concn. and expts. are tabulated which show free Cl even at 1.1 sp. gr.; thus Steinfels' proposed 1.175 sp. gr. for the dichromate method (C. A. 9, 3371), which was selected by him to afford the least Cl evolution without impairing full oxidation of the glycerol, is shown to be too low for that purpose. Steinfels now endorses the 1.230 sp. gr. If NaCl is present it is safest to remove it by Pb acetate and Ag oxide.

P. E.

Palm oil as a motor fuel (ANON.) 21.

**Neutralizing and deodorizing oils or fats.** E. R. BOLTON and E. J. LUSH. U. S. 1,419,109, June 6. Oils or fats, e. g., coconut oil, contg. free fatty acids are treated with monoglycerides of the fatty acids present in chem. equiv. proportions and heated under reduced pressure. Cf. C. A. 15, 2204; 16, 169.

**Refining fatty oils.** M. RYNNOLDS. U. S. 1,419,760, June 13. Cottonseed oil or similar oil which is "off color" is brought to the desired standard color by repeated alternate bleaching and saponification refining.

**Catalyst.** W. D. RICHARDSON. U. S. 1,419,986, June 20. A catalyst adapted for use in *hydrogenating oils* is prepd. by abrading Ni or other catalytic metal in the presence of  $\text{H}_2\text{O}$  in a ball mill, preferably with sand, emery or other abrasive.

**Soap containing clay.** E. G. ACHESON. U. S. 1,419,952, June 20. Clay is deflocculated to render a portion colloidal and then reflocculated in the presence of the residue and mixed with soap-stock in order to improve its detergent and lathering properties.

## 28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

*The sugar production of the various districts in Java, 1920.* J. H. RITMAN. *Arch. Suikerind.* 30, 249-56(1922).—Statistical tables; cf. C. A. 13, 1543. F. W. Z.

*The limits of sugar accumulation in beets.* ALFRED LODE. *Blätt. Zuckerrüb.* 29, 25-9(1922).—A discussion, on the basis of the present knowledge of sugar and starch synthesis by plants, of the possible max. limits of sugar accumulation in beets.

P. R. DAWSON

*The proper distance between sugar beets.* A. HERZFELD. *Z. Ver. deut. Zuckerind.* 72, 141-59(1922).—A bibliography, containing 34 titles, with abstracts, on the effect of distance upon yield of beets and sugar.

F. W. ZERBAN

*Selection of mother beets with the refractometer.* EARL KOMERS. *Blätt. Zuckerrüb.* 28, 177-83, 194-200, 220-25(1921).—A method is described and a formula is developed for calcg. the approx. concns. of sugar and non-sugar from the refractive index. In most cases the results compare favorably with those obtained with the polarimeter. On account of its much greater rapidity this method has many advantages when applied to the selection of stock on a large scale; where greater accuracy is demanded it may be supplemented by polarimetric detns.

P. R. DAWSON

*The effect of amino acids in cane juice on factory operation.* J. W. L. VAN LIGTEN. *Arch. Suikerind.* 30, 216-21(1922).—Since it had been found (C. A. 15, 2009, 2561) that amino acids counteract the inverting effect of acids, molasses, which contains amino acids, should have the same property. A number of inversion expts., in the presence and absence of molasses under various conditions, showed that molasses in fact prevents or minimizes the effect of the H-ions, and molasses itself, although acid, does not invert cane sugar under the conditions investigated.

F. W. ZERBAN

*The effect of the coloring matters in the cane and the role of oxidases in manufacture.* E. HADDON. *Rev. agr. Maurice* 1, 20-2(1922).—In a summary of previous work (C. A. 11, 545; 13, 82, 2142, 2295; 14, 230, 2868; 15, 186) H. confirms the opinion of other investigators that the color of cane juice is largely derived from Fe compds. of polyphenols.

F. W. ZERBAN

*How to determine by artificial light the proper amount of lime to be added to sulfured juice.* ANON. *Rev. agr. Maurice* 1, 31(1922).—Litmus paper cannot be used at night. Phenolphthalein paper should be employed instead, after addition to 10 cc. of juice of 4 drops of a soln. prepd. from 150 g. sucrose, 50 g. quicklime, one l. water and 10 drops preservative (made by dissolving 22 g. HgI<sub>2</sub>, 25 g. KI, and 40 cc. of 40% HCHO in 200 cc. water); let stand 5 hrs. and filter. The proper amt. of lime has been added if the paper turns slightly pink, but not red.

F. W. Z.

*What is the best temperature for purging after-product massecuite?* G. SCHACKER. *Z. Ver. deut. Zuckerind.* 72, 200-1(1922).—Since the viscosity decreases with rising temp., some test runs were made in which the massecuite, after being boiled to 96° Brix, was purged at 60-5°. Steam had to be passed into the centrifugal casing to prevent the sugar from getting hard and to make the molasses run freely. This method was found to offer no advantage over the one ordinarily used where the massecuite is boiled to 96° Brix, 4% water drawn in and the massecuite dropped at 92° Brix. The fine grain is all dissolved by this procedure.

F. W. ZERBAN

*Purity of run-offs and purging of second massecuite.* E. HADDON. *Rev. agr. Maurice* 1, 23-4(1922).—It is a mistake to add molasses of 30-5° Baumé to low-grade massecuites, because sugar will be dissolved and the yield reduced. The molasses to be added must be at least 36° Baumé and as little as possible must be used, since an in-

crease of one point in the purity of the final molasses means a 3% loss in the sugar yield. Directions for boiling low-grade massecuites are given. There are mistakes in the temp. correction tables for densities, and they should be revised. F. W. Z.

**Measuring the temperature of purged sugar.** A. KRAISY. *Z. Ver. deut. Zuckerind.* 72, 159-62(1922).—The temp. of the sugar at the time when it is dropped from the centrifugal largely affects its degree of dryness and its keeping quality. This temp. is detd. by first taking the temp. in the interior of a Dewar bulb ( $t_1$ ). Then a known wt. of the sugar ( $G$ , about 200 g.) is put into the bulb, a thermometer introduced, and the bulb stoppered. When the temp. becomes const., it is read again ( $t_2$ ). The temp. of the sugar is then  $t_3 + [W \times (t_2 - t_1)] / 0.3 G$ . The water value  $W$  of the bulb is detd. in a sep. expt. by pouring a g. of hot water of temp.  $t_4$  into the Dewar bulb, and reading the temp. before ( $t_2$ ) and after adding the water ( $t_4$ ). Then  $W$  equals  $a(t_4 - t_2) / (t_4 - t_3)$ . A thermometer divided into whole degrees is sufficient. Most accurate results are obtained when the temp. difference between the empty bulb and the sugar is small. The limit of accuracy is about  $1^\circ$ , as shown by examples. F. W. Z.

**Mutual factory control.** A. HARTEVELT. *Arch. Suikerind.* 30, 152-3(1922).—Reply to Leistra (*C. A.* 16, 1516). Polemical. Reply. P. LEISTRA. *Ibid* 154-5.

F. W. ZERBAN

**Thorough cleaning of the tubes of the effects.** P. VRINS. *Arch. Suikerind.* 30, 245-7(1922).—Complete directions are given for cleaning the outside of the tubes in the steam chamber, without removing them, by means of NaOH, followed with kerosene oil.

F. W. ZERBAN

**A new pump for the sugar industry, "Integrale."** J. A. MARONIER. *Arch. Suikerind.* 30, 173-8(1922).—This is a new rotary pump of French manuf., belt or gear driven. The housing is not circular, but made of paraboloid sections. It can be used, at 200 r. p. m., for pumping water, juice, sirup, or molasses, or at 500 r. p. in., as a wet or dry air pump. Illustrated.

F. W. ZERBAN

**Automatic weighing apparatus.** D. ROMONDY. *Arch. Suikerind.* 30, 289-92(1922).—A detailed description, with illustration, is given of an automatic weighing tank which can be built in the machine shop of any sugar factory; it can be used for maceration water, but not for raw juice.

F. W. ZERBAN

FUHR, E.: Verslag van de Technische Afdeling van het Proefstation voor de Java-Suikerindustrie. Reviewed in *Z. Ver. deut. Zuckerind.* 72, 208.

KIEHL, A. F.: Ertragreicher Zuckerrübenbau. 2nd ed. Berlin: Paul Parey. M 21. Reviewed in *Z. Ver. deut. Zuckerind.* 72, 295.

HUIJSMAN, C.: Adresboek voor de Java-Suikerindustrie. Reviewed in *Arch. Suikerind.* 30, 186(1922).

**Edible extract from sugar beets.** P. KESTNER. U. S. 1,419,057, June 6. Sugar juices from beets are heated in an evaporator under pressure for a short time to insure the deodorization of the material and the pressure is then relieved by permitting the liquid to flow out from the evaporator.

**Storing sirups and molasses.** W. L. OWEN. U. S. 1,418,457, June 6. Molasses or similar material is subjected to the action of  $\text{CO}_2$  under pressure to displace entrained air and is then stored under pressure of  $\text{CO}_2$  maintained at 45 lbs. per sq. in. or higher.

**Soluble starch products.** A. W. H. LENDERS and H. P. BAUER. U. S. 1,418,311, June 6. A  $\text{H}_2\text{O}$  soln. of modified or thin boiling starch is first made by ordinary acid hydrolysis and the soln. is then heated to a temp. which instantaneously evaps. the  $\text{H}_2\text{O}$  and further modifies the starch.

**Starch mixtures for starching machines.** D. H. BENJAMIN. U. S. 1,418,275,

June 6. The pat. relates to the manner of agitating and circulating starch mixts. for starching machines and for controlling their temp.

**Cooking and "creaming" starch.** D. H. BENJAMIN. U. S. 1,418,274, June 6. A portion of the starch mixt. is withdrawn from a vessel contg. it and sprayed into the upper portion of the vessel above the level of the liquid while the mixt. is cooled. U. S. 1,418,273 relates to an app. for cooking starch and for starching.

**Apparatus for preparing steam-cooked starch for laundry purposes.** E. W. MILLER. U. S. 1,418,320, June 6.

## 29—LEATHER AND GLUE

ALLEN ROGERS

**The hormone theory of tannin formation.** W. MOELLER. *Z. Leder- u. Gerberei-Chem.* 1, 64-7, 73-80, 107-14, 143-5, 171-83 (1921-2).—"Throughout of a purely theoretical nature," "speculative research." Polyphenols in the plants act as hormones in autoxidation, the final products being tanning systems. F. L. SHYMOUR-JONES

**The use of orpiment in tanning.** P. HUC. *Industries du cuir* 175-7 (June 18, 1922).—For proper results the orpiment used in tanning should be of const. compn. By using 0.8-1.2% (on the wt. of CaO) of yellow orpiment of the Compagnie Minière et Métallurgique d'Auzon, H. obtained good results when working on a large scale. He recommends the following procedure for the prepn. of the "lime." To a suitable amt. of quicklime add the required amt. of orpiment, slake, and stir until the mass turns blueish. Add water in the usual way, and immerse the skins. The orpiment is thus transformed into Ca thioarsenate. A. P.-C.

**Hot-soluble tanning extracts.** GABRIEL DESMURS. *Industries du cuir* 179-85 (June 18, 1922).—A brief discussion of the compn. and properties of dry tanning exts. together with the results of typical analyses carried out by D. on various exts.

	Insol.	Tannin.	Non- (Shake.) tannins.	H <sub>2</sub> O.	SiO <sub>2</sub> .
Dry chestnut ext. (av. of 4 samples)	5.71	57.32	27.46	9.51	
Wattle-bark ext. (av. of 5 samples)	3.43	61.96	20.09	14.52	
Myrobalans (3 samples)	6.33	48.63	32.10	12.94	
Algaroba (carob) (4 samples)	8.20	45.80	35.85	10.15	
Valonia (3 samples)	0.70	63.50	23.46	11.34	
Dry quebracho (Crown brand)	0.35	66.49	16.86	16.30	
Oak ("garouille")	6.60	53.60	28.60	11.20	
Hemlock	15.43	44.00	29.14	11.43	
Cutch (in sheets) (8 samples)	3.80	50.54	26.75	18.91	
Gambier (in cubes) (4 samples)	16.20	39.94	31.93	11.93	
Cascarilla bark (2 samples)	11.30	42.85	30.83	15.02	
Burmah cutch I	6.50	50.00	21.70	12.80	9.00
Burmah cutch II	10.70	40.30	22.20	9.00	17.80
False cutch (dry mangrove ext.) (3 samples)	1.20	60.50	22.15	16.15	
Dry gallnut ext. (2 samples)	0.45	77.40	12.78	9.37	
Tamarisk galls (4 samples)	17.93	54.37	12.75	14.95	

A. P.-C.

**The tanning-chemical behavior of synthetic tannins containing the sulfonic group.** II. W. MOELLER. *Z. Leder- u. Gerberei-Chem.* 1, 203-10 (1922); cf. *C. A.* 16, 1676.—Four synthetic tannins and a sulfite-cellulose ext. were tested as to hydrolyzing power

on hide powder and resistance to boiling water of leathers tanned therewith, as in previous work. Esko ext. and Carbatan gave low hydrolysis and good water resistance; Korinal and Wormatol appreciably digested hide powder and showed low water resistance. Sulfite cellulose did not hydrolyze hide powder, but was very little resistant to boiling water. An exact explanation of causes is impossible owing to lack of knowledge of exact mfg. conditions of the exts.

F. L. SEYMOUR-JONES

The connection between hydrolysis and adsorption. W. MOELLER. *Z. Leder-u. Gerberei-Chem.* 1, 160-5, 183-8(1922); cf. *C. A.* 15, 1638; 16, 1676.—The swelling and hydrolysis of gelatin in HCl, AcOH, lactic and butyric acids was studied. Concns. of acid of 0.1, 0.05, and 0.01 *N* were used for periods of 1 hr., 1, 2, and 5 days. 4.4 g. of powd. gelatin was added to 100 cc. acid in a flask, the whole well shaken and allowed to stand. The liquor was filtered, with or without kaolin, to est. the degree of dispersion of the hydrolyzed material, and N detd. in the filtrate. Results similar to those with hide powder were obtained. Hydrolysis products with org. acids are adsorbed by the intact gelatin. With mineral acids hydrolysis, and with org. acids adsorption predominates.

F. L. SEYMOUR-JONES

### 30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

The rubber industry. JACOBS. *Revue industrielle* Dec. 1921, Jan. 1922; *Industrie chimique* 9, 265(1922).—A review covering production and consumption, the chemistry of rubber, artificial rubbers, loading materials, vulcanization, accelerators, and analysis of rubber.

A. P.-C.

Tackiness of crude rubber and aging of vulcanized rubber. CAMILLO PELIZZOLA. *Giorn. chim. ind. applicata* 4, 200-3(1922); cf. Bruni and Pelizzola, *C. A.* 16, 1884.—Tackiness of rubber is due to oxidation and depolymerization, the former preceding the latter. P. confirmed Gorter's results, that levulinic aldehyde is present in tacky rubber. Knorr's reaction may be used as a means of rapidly detg. the degree of tackiness: In a test-tube place a few g. of rubber, together with a little solid AcONH<sub>4</sub>, heat directly over a flame and introduce into the vapors a splinter of wood moistened with HCl. If splinters from the same piece of wood are used the intensity of the red color produced is in proportion to the tackiness of the rubber, going from a strong dull red color with pronouncedly tacky rubber to an absence of color or scarcely perceptible pink color with good rubber. Isoprene does not affect the result. In general the oxidation of rubber is an autoxidation process, during which, with crude as well as with vulcanized rubber, formation of an ozonide takes place. This oxidation may occur in 2 different ways, giving rise to 2 series of products: (a) by the action of ordinary O, oxygenated substances (resins) are produced which are sol. in alc. and Me<sub>2</sub>CO and insol in H<sub>2</sub>O. (b) By the action of active O or ozone, ozonides are produced, and from these, by the action of H<sub>2</sub>O, are formed their products of hydrolysis (levulinic aldehyde or acid) sol. in H<sub>2</sub>O and reducing. Both these processes take place at the same time. The second is particularly favored by the action of direct sunlight and of certain oxidizing agents like the oxides of Mn and Cu. Caoutchouc that has become tacky, as well as that vulcanized and aged, is, as such, irremediably lost.

ROBERT S. POSMONTIER

Vulcanizing rubber. B. D. PORRITT. U. S. 1,418,166, May 30. Vulcanization is accelerated by the use of PhONa or similar compds.

Vulcanizing rubber. S. M. CADWELL. U. S. 1,417,970, May 30. Rubber is vulcanized after admixture with S and fillers and an aldehyde-amine reaction product, such as that of acetaldehyde or heptaldehyde and aniline which serves to accelerate the vulcanization.



**Vulcanizing rubber.** P. SCHIDROWITZ. U. S. 1,418,976, June 8. A vulcanization accelerator is prepd. upon a carrier which is to be incorporated in the rubber mixt., e. g., china clay 100 is mixed with piperidine 20 parts and the mixt. is treated with CS<sub>2</sub> vapor. Cf. C. A. 16, 1164.

**Vulcanizing rubber.** R. B. NAVLOR. U. S. 1,418,824, June 6. A condensation product of *p*-toluidine and CH<sub>2</sub>O is used as a vulcanization accelerator. U. S. 1,418,825 relates to the use of S and phenylhydrazine.

**Vulcanizing rubber.** C. W. BEDFORD and R. L. SIBLEY. U. S. 1,418,771, June 6. The reaction product of equimol. proportions of H<sub>2</sub>S and *p*-nitrosodimethylaniline is used as an accelerator. Cf. C. A. 16, 1681.

**Vulcanizing rubber.** C. W. BEDFORD. U. S. 1,418,772, June 6. S and methylenediphenyldiamine are used to prep. a reaction product which acts as an *accelerator* of vulcanization. Cf. C. A. 15, 1832.

**Coating golf balls.** O. HOMMEL. U. S. 1,419,258, June 13. A compn. for quick coating of golf balls by dipping is formed from pyroxylin, a solvent such as AmOAc, a pigment, e. g., flake white, and small amts. of dammar varnish and rubber cement.

